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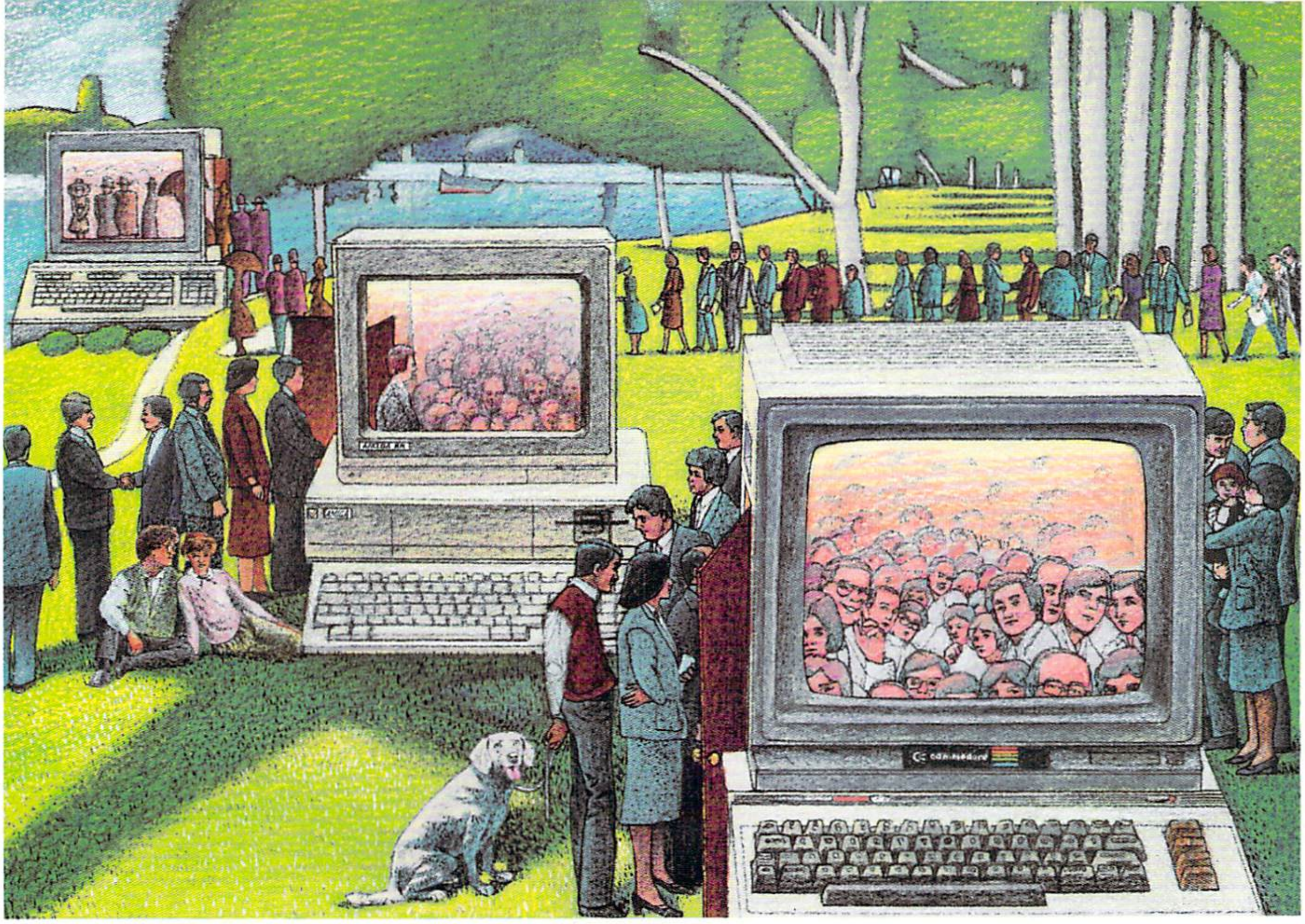
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Ahoy!

CONTENTS

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FEATURES

*Includes program: *Digital Scope* (for the C-128)
**Includes programs: RECTANGLE.S and RECTANGLE.BAS (for the C-128)

PROGRAMS

Cover art by James Regan

ISSUE NO. 34 OCTOBER 1986

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If you own a C-64, you

The one you purchased. And the

GEOS realizes the technical potential that has been in the C-64 all along. Speed. Power. Ease of use. Sophistication. Elegant, practical applications you might expect of a high-end personal computer, all made possible with GEOS. It's so simple—but then, so was fire. Once it caught on.

To begin at the beginning. **GEOS** stands for **GRAPHIC ENVIRONMENT OPERATING SYSTEM.** Why?

GRAPHIC: Because menus and icons replace long, typed command lines. Point and click, that's it.

ENVIRONMENT: Because GEOS provides a consistent, powerful way to use your computer. Learning new applications is a snap (or should we say click).

OPERATING SYSTEM: Because GEOS orchestrates every function so that they all work together systematically, even symphonically.

Some basics. Icons are graphic images which represent files or utilities. Each is different, and all are easy to recognize and easy to use.

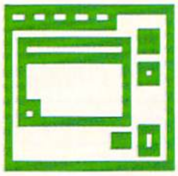
A menu is just that: a list of functions available for selection. When a menu appears, move the pointer to any item you wish. Click. Click. You're on your way.

A pointer is used to select and activate items. To move the pointer, roll the mouse or trackball or rotate the joystick. Once on target, click once to select; click a second time to activate.

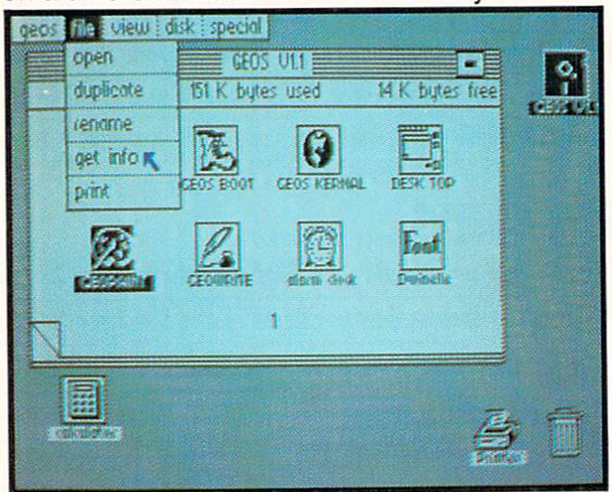
Fonts are a new way of looking at text. Choose from 5 different fonts (with more on the way). Try Dwinelle, or Roma, **bold,** or *italics,* even <u>underline</u> and outline. Need to fit more words on a line? Pick a smaller point size, like University 6 point, and get over one hundred characters per line.

All this and fast too. Because the integrated diskTurbo software improves 1541 disk drive performance 5 to 7 times. That's right. On both reads and writes.

GEOS can be divided into 4 areas: two functional aspects (deskTop and Desk Accessories), and two major applications (geoPaint and geoWrite).



deskTop. deskTop is a graphic interface, making file organization and management easy. As always, you call the shots. Load a disk. Files appear as icons on the disk notepad; to flip through, point at the folded corner and click. Prefer a file appear on a different sheet? Move it. It's easy.



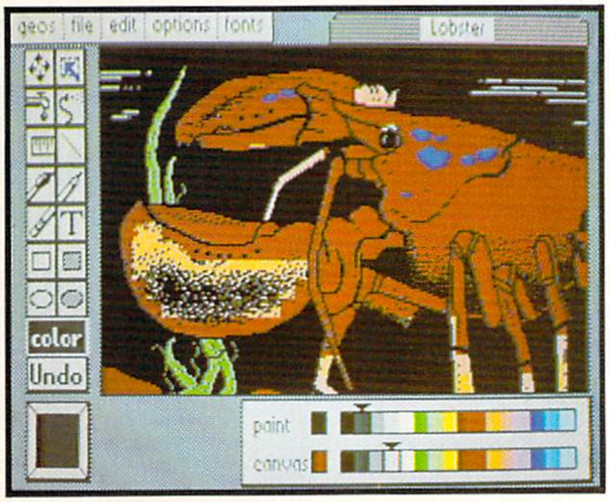
Create a new document or re-name an existing one. Want to copy a file onto the same or a different disk? Fine. Forgotten what a file contains? Select "get info" from the file menu. A description of that file's contents appears. Finished with a file? Print it. Save it. Or drop it in the trash and have done with it. Your call.



geoPaint. A full-featured, color graphics workshop at your fingertips. The pointer operates any one of the fourteen graphic tools and shapes in the drawing menu. Create masterpieces on the Drawing Window. By turns, use a pencil, an airbrush or a paint brush, each with a character all its own. Draw straight lines, squares, rectangles or circles. Fill in with any of the 32 patterns. Switch to pixel-mode, where each dot in a selected section is magnified many times its size for easy manipulation.

own two Machines.

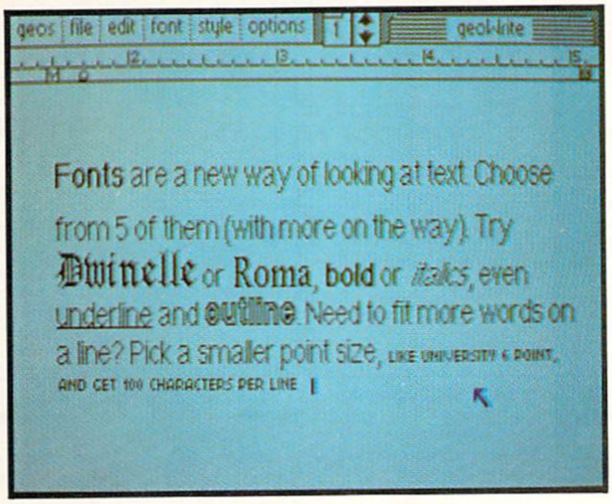
personal computer GEOS™ unlocks.



Second thoughts? Erase what you don't want. Or "UNDO" your last act. (If only life could imitate art!)

Add text if you like, in different fonts, styles or point sizes. Even change its position or layout at will.

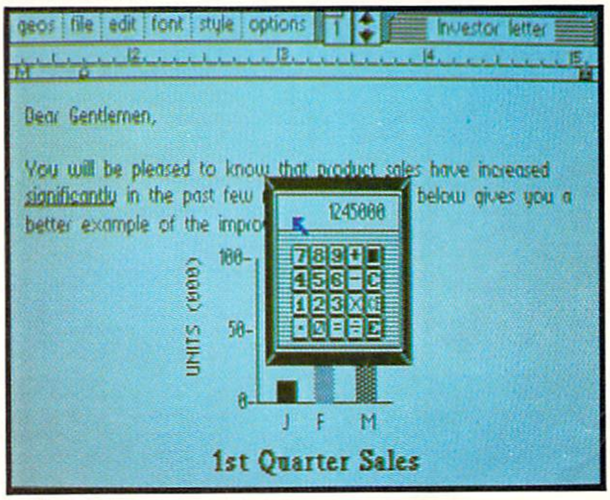
Move or copy any part of your creation. Once done, you can include your artwork in another document—a letter home perhaps. (Won't Mother be pleased?) GEOS makes it easy.





geoWrite. An easy to use, "what you see is what you get" word processor. Create documents. Insert, copy, move or delete text as you wish. Choose from 5 different fonts in many different styles and point sizes. Preview your page exactly as it will appear off the printer. Typists will appreciate tabs, word-wrap and page breaks.

Documents may contain up to 64 pages. What's more, you can move to any page instantly. If you like, you can cut selected text from one section and move or copy it to another. Add graphics from geoPaint. It's a cinch.





Desk Accessories. Handy programs you can use while in any GEOS application. These include an alarm clock, a notepad for reminders, a four-function calculator, and photo and text albums which store pictures and phrases you may then paste into applications. The Preference Manager even lets you establish parameters for everything from mouse speed to the date and time—even background color. Civilized options, every one.

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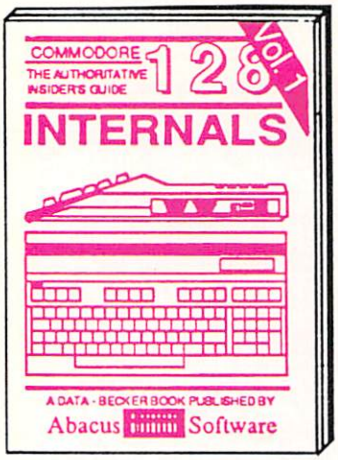
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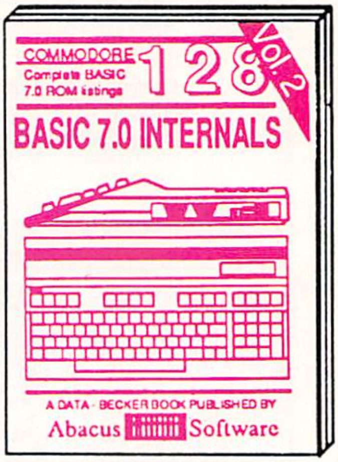
GEOS Diskette includes deskTop, diskTurbo, geoPaint, geoWrite and desk Accessories $59.95.
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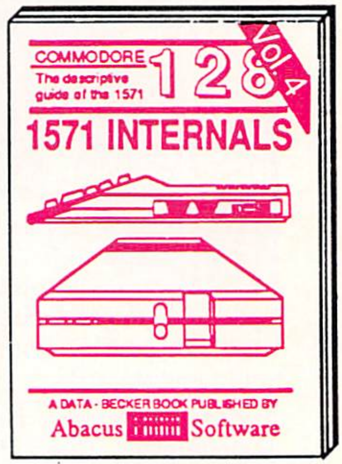
Detailed guide presents the 128's operating system, explains graphic chips, Memory Management Unit, 80 column graphics and commented ROM listings. **500pp** $19.95



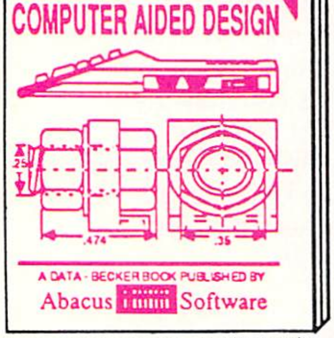
Get all the inside information on BASIC 7.0. This exhaustive handbook is complete with commented BASIC 7.0 ROM listings. Coming Summer'86. $19.95



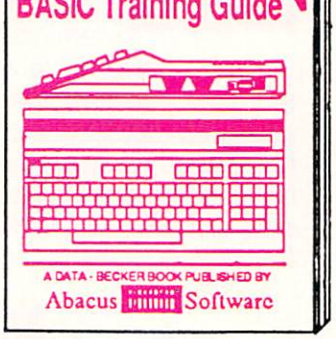
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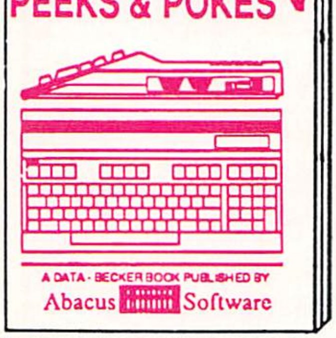
Insiders' guide for novice & advanced users. Covers sequential & relative files, & direct access commands. Describes DOS routines. Commented listings. $19.95



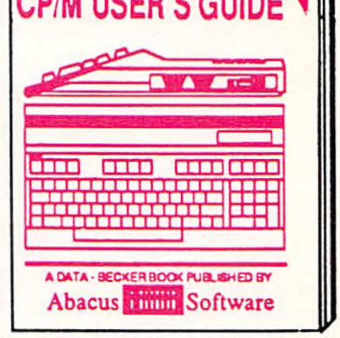
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VIEW FROM THE BRIDGE

If the *Ahoy! Disk* gets any better, we'll have to subscribe ourselves...and we get it for free! These past four months, we've shipped nearly full, with programs provided by the COMAL Users Group occupying the space left over by our monthly lineup. This month, we've given COMAL a rest to provide another exciting commercial program.

The *Talking Disk* from Covox is more than a demo of their $89.95 Voice Master: its several programs are entertaining and educational in their own right. As detailed in the August *Scuttlebutt,* the $5.00 disk includes a talking keyboard, a calculator that converses in English, Spanish, and German, and instructions for creating voice synthesized programs. Because of the software's total length—over 400 blocks—we've had to double-side the *Ahoy! Disk* to fit it all in. But despite that, and the inclusion of a 28-page manual, the October disk costs the usual $7.95 (see page 54).

Believe us: they're not giving it away simply because they can't give it away. The disk and booklet would provide an outstanding introduction to the world of Commodore speech synthesis, even if you had to pay $5.00 for it—but you don't have to!

We'd love to devote the rest of this page to the bonuses we have planned for future disks (including a recent, nationally advertised release from a major game manufacturer)—but we're equally excited about the contents of this, the October issue of *Ahoy!*

• Though Cleveland M. Blakemore's *Vault of Terror* was easily the best adventure game we'd ever seen in 70 blocks or less, we knew what aspect of it would frighten readers the most: typing it in. To encourage the reluctant, we've run it in the same issue as Cleve's shorter *Penguins* (page 16). Once you've whet your appetite on the latter, you'll want to plunge headlong into the *Vault!* (Turn to page 58.)

• Each month when he hands in his column, we wonder: how long can Dale Rupert keep it up? Surely he'll have to run out of original, exciting topics for the *Rupert Report* one of these days! But he hasn't disappointed us yet...least of all this month, as he leads C-128 and C-64 users on *Analog to Digital Adventures.* These include building and programming an onscreen oscilloscope and an optical version of a Theremin. (Turn to page 20.)

• What would an issue of *Ahoy!* be without a Buck Childress program? Probably yellowed with age—because with the exception of one month, Buck's work has appeared in every issue dating back to December of last year. His latest program is his longest: *Quick Change*, a powerful BASIC search and replace. (Turn to page 52.)

• We gathered from last month's *Trapped* that Mike Hoyt knew how to pack an awful lot of program into a small amount of code. But we were nonetheless felled by *Attack Force.* (Seriously, Mike—do you have any experience with missionaries' heads?) (Turn to page 72.)

• If you believe reports that the Dvorak keyboard layout will eventually become the standard, you'll want to start getting your fingers in shape. To that end, we've presented C-64 and C-128 versions of *Dvorak Keyboard.* (Turn to page 57.)

• As rocks rain on his head and appropriate theme music plays, *Mountaineer Mack* must scramble to the top of six hills. (Turn to page 18.)

• In this month's *Commodore Roots,* Mark Andrews reveals *The Fastest Draw in the Industry*—that is, he reveals techniques that top pros use in writing fast assembly language programs. (Turn to page 27.)

• The answer to many a 128 user's dilemma, *128 to 64 Autoboot* allows the computer to go into 64 mode and automatically boot a program, when activated by a timer or otherwise. (Turn to page 50.)

• Operational with the C-64, Plus/4, C-16, or VIC 20, *Disk Checkup* helps 1541 users to diagnose the health of their floppy files. (Turn to page 97.)

• What better time than October to plan your holiday shopping? Our *Christmas '86 Preview* suggests a number of game packages due for release before the end of the year. This month's *Entertainment Software Section* also includes reviews of *Murder on the Mississippi, GBA Championship Basketball (Two-on-Two), Europe Ablaze, World Karate Championship, Oo-Topos,* and *Super Bowl Sunday Expansion Disk #2*. (Turn to page 41.)

We regret the absence of the *Cadet's Column* from this issue, but expectant motherhood made some demands on Cheryl Peterson that rendered her unable to meet this issue's deadline. One or the other had to be shelved for this month—and over our protests, Cheryl shelved us. So it's 30 days liberty for all cadets—until next month, when Cheryl introduces you to the Promal language.

But almost everything else you buy *Ahoy!* for is to be found between this month's covers: including an extra-long installment of *Tips Ahoy!, Reviews* of *21-Second Backup* and *IntraCourse,* Dale Rupert's *Commodares,* and more. If there's anything you're not getting enough of (within reason), please write to tell us. *—David Allikas*

AHOY! BBS GOES 1200 BAUD!

Effective immediately, the 24 hour a day *Ahoy!* Bulletin Board System can be accessed at 300 or 1200 baud, in 40 or 80 columns.

Corrections to programs and articles, editorial calendar for upcoming issues, and excerpts from future news sections are some of the files available for download.

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ACTIVISION PRODUCTIVITY

Activision has branched out from the entertainment business into a line of home and personal productivity programs for the C-64. The following are the first releases in the series, dubbed *Personal Choice Software:*

The *Writer's Choice* word processor includes a 50,000 word spelling checker, help screens, and a full layout preview option that allows the writer to see what a document will look like before printing it.

Filer's Choice lets the user tailor-make computer "index cards" and sort records alphabetically or numerically. A report writer makes it possible to extract information from multiple fields and combine it into one file for report generation and document production. Context-sensitive help screens address specific problems.

The *Planner's Choice* spreadsheet permits the user to select column width, while horizontal and vertical windowing allows him to view different sections simultaneously. "What-if" games are provided for experimentation and modification of data.

Titles are $39.95 each, or $99.95 for the *Personal Choice Collection* of all three.

Activision, Inc., 415-960-0410 (see address list, page 14).



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MANUAL PROGRAMMING

In April's *Scuttlebutt* we announced that ShareData had licensed the C-64 rights to VPL Research's "grasp" technology, consisting of a visual programming language operated by a glove input device. ShareData has now completed and released Hand-Command, a transmitting device inside a lightweight cotton glove available in three sizes for lefties or righties. The position, tilt, and bend of the hand is measured in three dimensions and translated into computer operations. The wearer can for example throw an imaginary dart and have the speed and angle measured and reflected, in real time and 3-D, on the computer screen. The product was scheduled for fall release.

ShareData, 1-800-328-6061 or 612-829-0409 (see address list, page 14).

DISK LIBRARIAN

The *Disk Librarian* comprises five C-64 programs: *Single Drive Copy V/4.0* (back up disks in a maximum of three minutes on a single 1541); *Security Seven* (back up a disk onto tape in a maximum of seven minutes); *Directory Modifier* (reorganize or add lines or comments to disk directories, lock or unlock files, and change file types or names); *Disk Directory Sorter V/4.0* (read all your disk directories into one large file for editing, sorting, searching, and printing out); and *Tape-Log* (catalog disks stored on tape with *Security Seven*).

Price is $35, shipping included (except COD orders); add $5.00 if you desire a backup copy.

Software Unlimited, 503-882-7110 (see address list, page 14).

AMIGA GUIDE

Focusing on graphics and sound, the *Amiga Programming Guide* ($18.95) provides readers with a basic programming foundation. Covered are initial setup, fundamentals of Amiga BASIC, LOGO, and C, information management with AmigaDOS, communication with other PCs, and interfacing with a VCR or stereo.

Que Corporation, 317-842-7162 (see address list, page 14).

COMPUTER CARE KIT

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Swiftcalc/Sideways(D) $33
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Sylvia Porter's Personal Fin. Planner 64 (D) ... $33
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Treasure Island (D) ... $9
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Bonus DS, DD ... $6.99 Bx
Compuserve Starter Kit ... $19
Disk Case (Holds 50) ... $9
Disk Drive Cleaner ... $9
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Panasonic 1080 100 cps. printer — GREAT DEAL
Sakata 13" Color Composite Monitor for C64 ... $139
Seikosha SP1000VC 100 CPS Commodore direct-connect dot matrix printer ... $179
Wico Bat Handle ... $17
Wico Black Max ... $9
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Philips ECG, 1-800-233-8767; in PA 1-800-222-9308) (see address list, page 14).

PLUS/4 AND C-16 SOFTWARE

While the level of software support for the Plus/4 and C-16 could make even an Adam owner chuckle, a bone is thrown from time to time. Robinson Software Associates has made three available at $9.95 each plus $1.50 postage per order. *Bounty Hunter* (round up a gang of outlaws in the Old West), *Grave Robbers* (a graphic adventure requiring players to find secret treasure), and *Savings & Loan* (a home finance program that calculates principal and interest payments and amortization of loans, as well as the value of various types of savings). (See also this month's *Game Releases* heading for a Plus/4 flight simulator.)

Robinson Software Associates (see address list, page 14).

FOOTBALL HANDICAPPING

The *Professional Football Handicapping System* lets the C-64 or VIC 20 user handicap NFL games using information found in the daily paper. About five minutes is required to enter the information needed to perform the statistical analysis that will predict the winner, point spread, and total points in a game. On cassette or disk; $39.95 plus $2.00 shipping.

Software Exchange, 313-626-7208 (see address list, page 14).

SYNTHESIZER PROGRAM

The *Fastfingers* synthesizer program includes 256 preset sounds derived from the SID chip, 13 effects (glide, vibrato, wah wah, etc.), and onscreen instructions, and provides for 10 minutes of real-time recording at 60 notes per second. A 4-octave keyboard with 49 full-size keys (apparently the Mattel keyboard originally manufactured for use with Intellivision) is also available. Price of the software and manual is $24.95; with keyboard adapter $59.90; with adapter and keyboard $119.85.

See-Thru Enterprises, 519-735-2995 (see address list, page 14).

TALKING SOFTWARE

Hearsay, Inc. has released three educational games that produce speech when used with a C-64 and the Hearsay 1000 speech synthesizer/voice recognition system (see January '86 *Ahoy!*). Each $29.95, they are *Rhyme and Reason* (familiar nursery rhymes teach basics like names of animals and parts of the body), *Aqua Circus* (basic shapes, colors, counting, and simple math), and *Think Bank (Concentration*-type game that teaches arithmetic).

Hearsay, Inc., 718-232-7266 (see address list, page 14).

CP/M SOURCE

FOG, the California-based CP/M users group, is offering a library sampler of CP/M software free to C-128 users who send in the $25 yearly membership fee by December 31, 1986. In addition to Commodore's revised CPM+ operating system (the original system shipped with the 128 contained bugs that prevented the serial port from operating), the disk contains a text editors with *WordStar*-like commands, a telecommunications program designed for both the Commodore 1670 and Hayes-compatible modems, a menu-driven file utility program for making file and disk copies, viewing files, etc. (eliminating the need to memorize CP/M commands), and a disk directory manager that sorts and prints directories and shows print status. Documentation is included.

FOG, a non-profit group with 20,000 members worldwide, maintains a large library of public domain software that is available for a small copying fee. Membership includes affiliation with more than 300 local chapters, and access to a technical support hotline operating from 10 a.m. to 5:30 p.m. (Pacific time), Monday through Friday.

FOG, 415-755-2000 (see address list, page 14).

ABACUSES FOR THE 128

Three new C-128 productivity packages from Abacus, each $59.95, scheduled for September release:

In addition to the standard options

found in most terminal programs, *SpeedTerm 128* features Xmodem and Punter file transfer protocols, VT52 and VT100 terminal emulation with cursor keys, 45K capture buffer, and user-definable function keys.

TAS-128, an enhanced version of Abacus' Technical Analysis System for stock marketing charting, lets the investor automatically download indicators from DJN/RS or Warner and then build a variety of charts on the split screen: 7 moving averages, 3 oscillators, 5 volume indicators, comparison charts, trading bands, least squares, and more. Included are macro capabilities, automatic and unattended log-on, and fast draw charts using up to four windows.

PPM-128, a 128 upgrade of *Personal Portfolio Manager,* tracks performance of stocks, bonds, or options, as well as profits and losses for tax purposes.

Abacus Software, 616-241-5510 (see address list, page 14).

MY NAME IS 128. C-128.

Developed and originally distributed by Creative Software, *I Am the C-128* ($34.95) is now available from Activision. The tutorial provides C-128 users with an introduction to programming, advancing from the basic keyboard layout to animation programs and debugging. Several practice programs are included for experimentation.

Activision, Inc., 415-960-0410 (see address list, page 14).

NORTH TO VERMONT

Though you may have thought the state produced nothing but maple syrup, *Vermont Gold* ($29.95) for the C-64 deals with various aspects of prospecting for gold in the state of Vermont, including tales and history facts about prospecting in the 1800's, how to look for and find gold in Vermont, equipment needed for prospecting and how to use it, and more.

Indian Affairs, 717-842-8467 (see address list, page 14).

GAME RELEASES

SubLOGIC has made available two new $19.95 Scenery Disks for use with their C-64 flight simulation products *(Microsoft Flight Simulator, Flight Simulator II,* and *Jet):*

The San Francisco STAR Scenery Disk takes in such Bay area highlights as Fisherman's Wharf, Alcatraz Island, and the Golden Gate, Dumbarton, and Bay Bridges. Mountains, lakes, and waterways are accurately located, and airports represented in detail, down to the hangars and refueling facilities.

The Japan Scenery Disk details the area from Tokyo to Osaka, including Mt. Fuji, the Shin Kansen bullet train, Osakajo castle, and the Tokyo Tower, Palace grounds, and canal network in downtown Tokyo.

SubLOGIC Corporation, 800-637-4983 or (in IL, AK, HI) 217-359-8482 (see address list, page 14).

Two C-64 releases from SSI, each $39.95:

Roadwar 2000, set in a post-nuclear attack age, requires the gamer (as the leader of a gang that conquers cities by collecting soldiers, vehicles, and supplies) to locate eight scientists who are crucial to the survival of the world and return them to their research base. 19 types of vehicles can be modified for different terrain, attack, defense, speed, and durability tasks. During the 50 or more hours or an average game, the road warrior interacts with numerous wanderers, rabble road gangs, mutants, cannibals, and foreign invaders.

The magically endowed *Shard of Spring,* remnant of the once-whole LifeStone created by the Red Sorcerer, must be taken back from its captor, the evil enchantress Siriadne, and returned to its home on the stricken island of Ymros. The player attempts to do this with the aid of up to five other characters, searching Ymros, fighting monsters, and exploring dungeons. Spells are cast using the five elements of nature: fire, metal, wind, ice, and spirit. The game is designed to last from 40 to 80 hours.

Strategic Simulations, Inc., 415-964-1353 (see address list, page 14).

A female version of Activision's *Alter Ego* for the C-64 allows the distaff gamer to respond to hypothetical situations according to the person-



Change the course of history with **Trinity**, *which takes the Infocom adventurer on a fast-paced journey through fantasy and reality. READER SERVICE NO. 127*

ality profile the program creates for her based on her responses to a series of questions. She may choose instead to let the computer select her personality for her and experience life through the eyes of an unfamiliar alter ego.

Activision, Inc., 415-960-0410 (see address list, page 14).

Through October 31, 1986, specially marked packages of IntelliCreations/Datasoft's *Mind Pursuit, The NeverEnding Story, Crosscheck,* and *Mercenary* will contain a card entitling the consumer to a free three-month subscription to *Computer Entertainer*, a 16-page newsletter containing software news and reviews. The regular subscription price for the four year old publication is $22 for 12 issues. Call 818-761-1516 for more information on *Computer Entertainer*.

IntelliCreations/Datasoft, 818-886-5922 (see address list, page 14).

The first Infocom game to recreate actual locations and events, Brian Moriarty's *Trinity* ($39.95) nonetheless leads the text-adventurer into an alternate universe where magic and physics coexist and he gets the chance to change the course of history. From a magical world overgrown with giant toadstools he progresses to the Siberian tundra, a tropical island, deep underground, outer space, and finally the New Mexico desert on July 16, 1945, the date and site of the world's first atomic explosion, codenamed Trinity.

Trinity was written with Infocom's Interactive Fiction Plus development system, allowing for more extensive stories and more sophisticated user interfaces. As a result, it is only available for Commodore computers with at least 128K: the C-128 and Amiga. The game is geared for the Standard Level player.

Infocom, Inc., 617-492-6000 (see address list, page 14).

As a reporter in search of *The Scoop* on the murder of a woman in a bungalow, you will look for clues, question witnesses, and eavesdrop on conversations. Based on the Agatha Christie story, the Telarium adventure game includes full animation and a text menu that facilitates interaction.



Ace *includes talking onboard computer. READER SERVICE NO. 128*

For the C-128; $32.95.

Telarium Corp., 617-494-1200 (see address list, page 14).

Spinnaker has licensed the rights from Britian's Cascade Games to distribute its *Ace* flight simulator, which it will do under its UXB label. The player/pilot's goal is to wipe out enemy air and ground forces, aided by multiple weapon systems, real-time overhead satellite mapping, and a talking onboard computer that advises on fuel levels and incoming missiles and aircraft. Additionally, a new Plus/4 version can be ordered from Cascade via check, credit card, or phone (see address list, page 14).

Spinnaker Software, 617-494-1200

(see address list, page 14).

Video Vegas simulates casino blackjack, draw poker, slots, and keno, providing entertainment for the beginner and practice for the pro.

Baudville, 616-957-3036 (see address list, page 14).

EDUCATIONAL SOFTWARE

Two from Gamco Industries:

Time Explorers requires students to answer time-telling questions correctly in order to advance through a cavern in search of gold. Activities are of four types: 1) type the digital time when shown a clock face; 2) type the digital time when given the time in words; 3) set the clock hands when given the digital time; and 4) set the clock hands when given the time in words. Within each, players may deal with hour, half hour, quarter hour, or five minute intervals.

Combining tic-tac-toe with a drill in money-changing skills, *Money Squares* questions future capitalists in the categories of 1) Count Money, 2) Can You Buy?, 3) Select the Fewest Coins, and 4) How Much Change?

Each C-64 program includes a student management system that automatically records up to 200 files. Price of each is $39.95; $54.95 with backup; or $164.95 for class pack.

Gamco Industries, Inc., 1-800-351-1404 (see address list, page 14).

Designed for beginning to expert typists, *Type!* ($39.95) teaches typing with real text and sentences instead of random letter drills. An arcade-style game is included. For the C-64.

Broderbund Software, 415-479-1170 (see address list, page 14).

The Linguist ($44.95) allows C-64 users to create language drills in French, Spanish, German, English, Russian, Hebrew, Japanese, or any of 13 other languages. The student selects two languages and enters as many words, phrases, or definitions in each of the chosen languages as desired. The program then quizzes him by presenting one of the elements in the pair and asking him to fill in its equivalent in the other language.

Gessler Educational Software, 212-673-3113 (see address list, page 14).



Interactive story books for children.
READER SERVICE NO. 129

The Grolier *Core Collection* of productivity software, including *The Information Connection, Friendly Filer, Easy Graph,* and *EduCalc*, will be made available to schools at savings of up to $60. Additionally, the *Database Management Enrichment Collection,* consisting of *Friendly Filer,* three *Friendly Files, NoteCard Maker,* and the *Countries of the World* and *The Great Book Search* databases, will be offered for $199.

Including over 100 lesson plans, the 192-page *Grolier's Productivity Software Across the Curriculum* provides educators with a guide to tailoring Grolier's productivity software to their curriculum needs. Ordinarily $12.95, the volume will be shipped free with orders of $75 or more.

Grolier Educational Publishing, 212-696-9750 (see address list, page 14).

Bantam has put two volumes of its *Choose Your Own Adventure* series of children's books on disk for the 64 at $34.95 each. In both animated adventures, the child becomes the main

character in the story and decides how it will evolve from a variety of plot options. *Escape* challenges the player to lead three characters out of a mazelike city and across enemy territory to home. *The Cave of Time* compels adventurers to return misplaced objects to their owners, fighting ghouls, a prehistoric mammoth, and assassins along the way.

Bantam Electronic Publishing, 212-765-6500 (see address list below).

Two educational entries in Baudville's *Hacker Jack* line: *Guitar Wizard* (learn and analyze scales, chords, and tunings for all types of fretted string instruments) and *Ted Bear's Rainy Day Games* (Concentration, Old Maid, and Go Fish). For the C-64; $29.95 to $34.95 each.

Baudville, 616-957-3036 (see address list below).

CBS has rereleased *Mastering the SAT* in an enhanced version for the C-64 and an all-new version for the Amiga. 64 users now get a full disk of additional Skill Builders exercises, an onscreen timer, a revised management system providing for up to seven students, and faster access to questions and answers. The Amiga version includes pull-down menus, windows, scrolling, and graphics.

Each version is available in a retail school package containing program disk, backup, 152-page student workbook, and teacher's notes, for $109.95 (lab pack, $329.85), or a retail package (program disk and student workbook) for $99.95.

CBS will also market *The Observatory,* under license from Lightspeed Software. The C-64 astronomy program allows students to set up a "software telescope" anywhere on earth

Continued on page 130

Companies Mentioned in *Scuttlebutt*

Abacus Software
2201 Kalamazoo S.E.
P.O. Box 7211
Grand Rapids, MI 49510
Phone: 616-241-5510

Activision, Inc.
2350 Bayshore Frontage Rd.
Mountain View, CA 94043
Phone: 415-960-0410

Addison-Wesley
Reading, MA 01867
Phone: 617-944-3700

Bantam Electronic Publishing
666 Fifth Avenue
New York, NY 10103
Phone: 212-765-6500

Baudville
1001 Medical Park Dr. S.E.
Grand Rapids, MI 49506
Phone: 616-957-3036

Broderbund Software
17 Paul Drive
San Rafael, CA 94903-2101
Phone: 415-479-1170

CBS Interactive Learning
One Fawcett Place
Greenwich, CT 06836
Phone: 203-622-2500

Cascade Games Ltd.
Harrogate, North Yorkshire, England
Phone: (0423) 525325

FOG
P.O. Box 3474
Daly City, CA 94015
Phone: 415-755-2000

Gamco Industries, Inc.
Box 1911
Big Spring, TX 79720
Phone: 1-800-351-1404; in TX call collect 915-267-6327

Gessler Educational Software
900 Broadway
New York, NY 10003
Phone: 212-673-3113

Grolier Educational Publishing, Inc.
95 Madison Avenue
New York, NY 10016
Phone: 212-696-9750

Hearsay Inc.
1825 74th Street
Brooklyn, NY 11204
Phone: 718-232-7266

Indian Affairs
R.D. #4 Box 68
Moscow, PA 18444
Phone: 717-842-8467

Infocom, Inc.
125 CambridgePark Drive
Cambridge, MA 02140
Phone: 617-492-6000

IntelliCreations/Datasoft
19808 Nordhoff Place
Chatsworth, CA 91311
Phone: 818-886-5922

Micro Arts Products
P.O. Box 2522
Philadelphia, PA 19147
Phone: 215-336-1199

Philips ECG, Inc.
100 First Avenue
Waltham, MA 02254
Phone: 1-800-233-8767; in PA 1-800-222-9308

Que Corporation
7999 Knue Road
Indianapolis, IN 46250
Phone: 1-800-428-5331 or 317-842-7162

Robinson Software Associates
50 South Valley Road B2
Paoli, PA 19301

See-Thru Enterprises
10382 Shenandoah
Windsor, Ontario
Canada N8R 1B5
Phone: 519-735-2995

ShareData, Inc.
7122 Shady Oak Road
Eden Prairie, MN 55344
Phone: 1-800-328-6061 or 612-829-0409

Software Exchange
P.O. Box 5382
West Bloomfield, MI 48033
Phone: 313-626-7208

Software Unlimited
P.O. Box 429
Klamath Falls, OR 97601
Phone: 503-882-7110

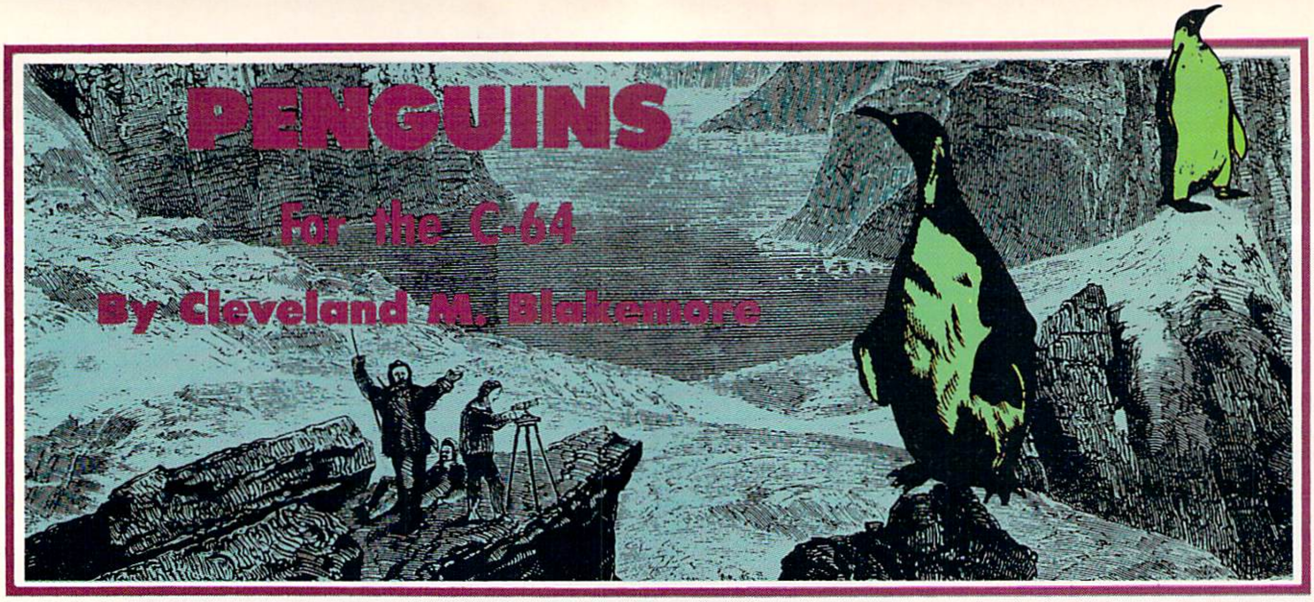
Spinnaker Software and Telarium
1 Kendall Square
Cambridge, MA 02139
Phone: 617-494-1200

Strategic Simulations, Inc.
1046 N. Rengstorff Ave.
Mountain View, CA 94043
Phone: 415-964-1353

SubLOGIC Corporation
713 Edgebrook Drive
Champaign, IL 61820
Phone: 800-637-4983; in IL, AK, HI 217-359-8482

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Reader Service No. 289



P*enguins* is a fast action arcade game with interrupt driven music and 24 (count 'em, 24) active sprites moving during gameplay.

The object is to get the poor penguin at the bottom of the screen to one of the ice caverns at the top. You have to cross two streams full of killer whales and get past a sniffing arctic wolverine who is looking for a few drumsticks for dinner. You also have to avoid the cave with the polar bear inside once you get to the top of the screen—you can tell which one is occupied by the set of red eyes inside.

With a joystick plugged into Port 2, you can move the penguin in all directions as long as he is standing on one of the three snowbanks. When he is in the water, however, he will coast forward unless you pull back on the stick to bring him to a dead stop.

There are safe ice floes at intermittent intervals between the killer whales, and when you are touching one you will stop coasting. It is possible for you to cling to one of these until you pass close enough to a cavern to swim off.

Score is determined by the green bar just below the ice caverns. It gradually turns red from right to left, showing you how much bonus score is left before time runs out. When time runs out, you receive no bonus score upon entering one of the caverns.

Bonus score varies from 100 points to 3900 points, depending on how long it takes you to get across the screen to the safety of the caves.

When you enter an ice cave, you must avoid the razor-sharp icicles on either side of the entry walls to get inside safely. If you enter a cave touching one of the icicles, or there is a polar bear inside when you enter, your little penguin will sprout angel wings and float off the screen.

If you enter safely, a victory fanfare plays, the penguin jumps for joy, and a new penguin is positioned at the bottom of the screen. Each time you enter a cave safely, the game picks up the speed a little.

You have three penguins per game, denoted by the three check marks on the bar at the bottom of the screen. To start a new game, hit f1.

My high score so far is 24000+. It gets pretty hard after about eight penguins, because the wolverine and the killer whales really start hustling.

The interrupt divides the screen into three different colors, moves the three separate groups of killer whales, and propels the wolverine along the snowbank, along with updating the musical theme.

I hope you take the time to type in *Penguins*—it is a nice inexpensive addition to your game library. Since the game is entirely in ML, you will need *Flankspeed* to type it in. ☐ *SEE PROGRAM LISTING ON PAGE 110*

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MOUNTAINEER MACK

For the C-64

By Stephen Devine

Mountaineer Mack is a fast-paced mountain climbing game for one player. You will need both quick reflexes and patience as you make your way to the top of each mountain. Randomly falling rocks are only one of the obstacles to avoid.

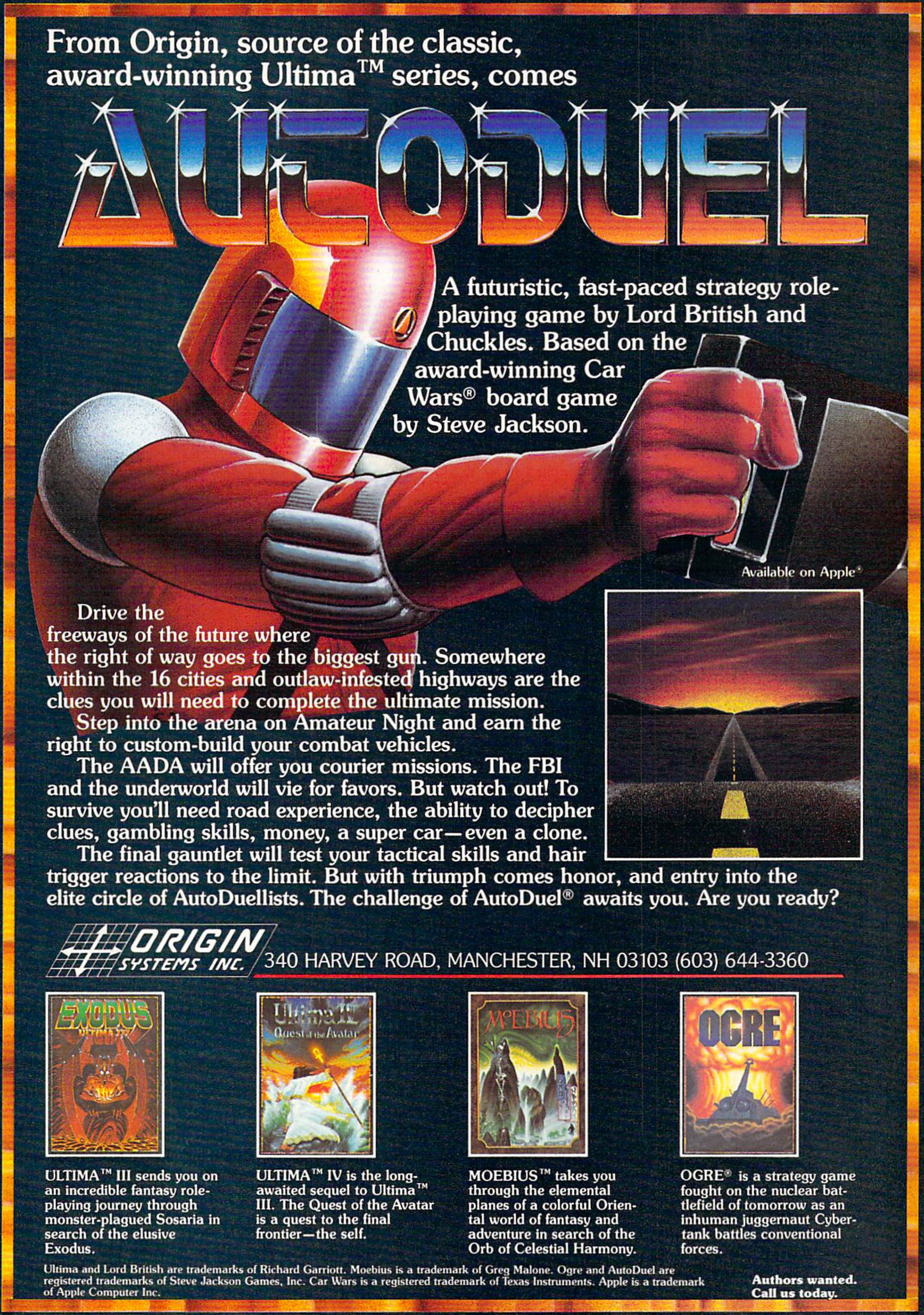
There are three levels of play, with each level having six mountains of increasing difficulty. Not only is each succeeding mountain higher in elevation, but the rocks become "smarter." The speed of the rocks also increases with each level.

You start each new game with three men, and a man is lost when contact is made with an obstacle. Bonus points are awarded every time you reach the top of a mountain and still have all three of your men. It is calculated by multiplying 50 by the mountain number (shown in the lower left-hand corner of the screen).

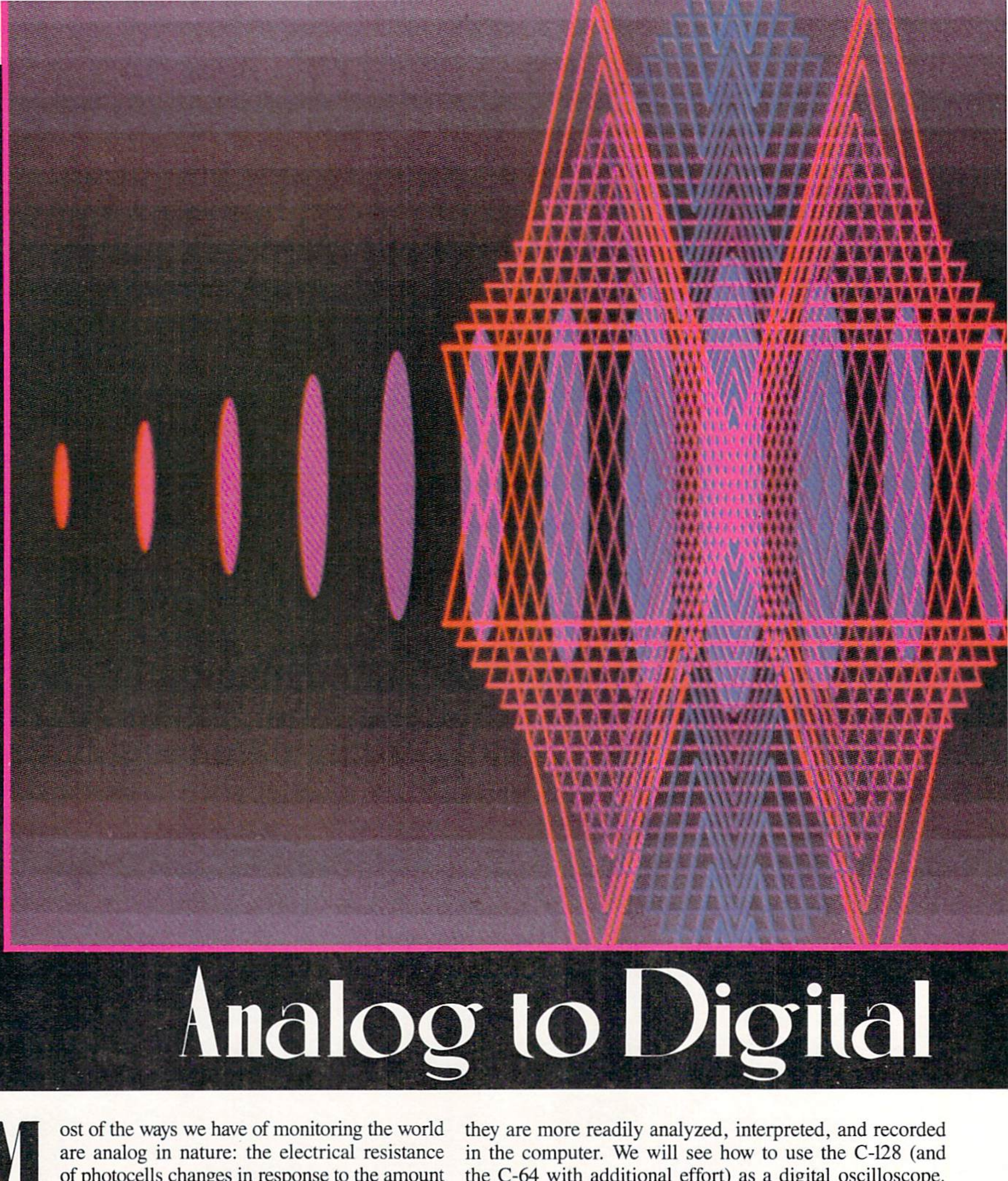
Mack is controlled by a joystick plugged into Port 2. He may move up, down, left, or right, but not off the sides or bottom of the screen. When climbing upwards, the mountain slope scrolls downward and your current elevation is updated. Each step upward adds five points to your score and 20 to the current elevation. Blue sky will appear at the top of the screen when the peak is near. (The rocks cease to fall at this point.) If Mack collides with an object on the screen, he falls to the bottom. You stay on the same mountain until either the top is reached or all your men are lost. A chime will sound and the high score will flash at the end of the game if the previous high score is beaten.

Mountaineer Mack resides in memory from $2000-$2D5B. It is entered using *Flankspeed* (see page 103). After entering and saving this program, reset the computer by turning it off and on. Then type LOAD "MOUNTAINEER MACK",8,1. Next type SYS 8192 and hit RETURN. Press the fire button to begin the game. ☐

SEE PROGRAM LISTING ON PAGE 115



Reader Service No. 291



Analog to Digital

Most of the ways we have of monitoring the world are analog in nature: the electrical resistance of photocells changes in response to the amount of light on them, the height of the mercury column in a barometer rises and falls in accordance with the atmospheric pressure, the needle of a speedometer is magnetically deflected in proportion to the speed of the automobile.

Among electrical engineers are those who deal primarily with analog circuits such as amplifiers and filters, and those who deal mainly with digital circuits such as microprocessors and flip-flops. Between the two groups is the realm of analog-to-digital (A/D) and digital-to-analog (D/A) conversions.

This month we will see how to convert analog signals as they exist in the real world into digital signals where they are more readily analyzed, interpreted, and recorded in the computer. We will see how to use the C-128 (and the C-64 with additional effort) as a digital oscilloscope. Finally, to avoid the "all work and no play" syndrome, we will end up with an optical counterpart of the age-old musical instrument made famous by horror films of yesteryear, the Theremin.

The Commodore 64 and the 128 each contain a multifunction circuit called the Sound Interface Device, better known as SID. This integrated circuit has the makings of a multivoice musical synthesizer complete with oscillators, filters, and the works. An additional feature of this chip is that it contains two analog-to-digital converters. These A/D (read "A to D") converters each generate an eight-bit digital word which is proportional to the analog signal at their inputs.

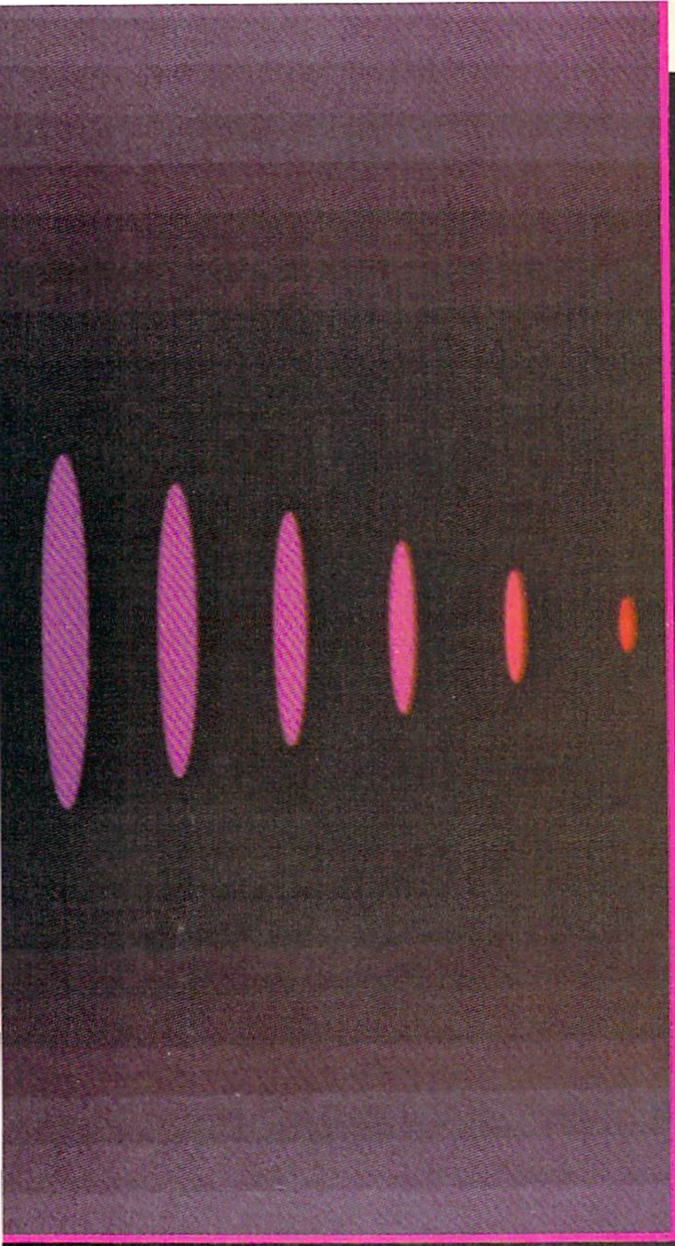


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Adventures

A DIGITAL OSCILLOSCOPE AND THE MAKINGS OF AN OPTICAL MUSICAL INSTRUMENT

By Dale Rupert

The inputs to the A/D converters are accessible through Control Ports 1 and 2 on the right side of the computer. The A/D converters are intended to be used with game paddles which are plugged into the Control Port connectors. Electronically, a paddle is a variable resistor called a potentiometer. The value of its electrical resistance may be changed by rotating or sliding the handle of the paddle. The Commodore's A/D converter can handle resistances ranging from zero ohms to about 500,000 ohms.

The paddles differ from joysticks on the Commodore computers. The joystick is digital in nature: each of its four switches is either open or closed. The paddle is an analog device: its output is a continuously variable signal.

The computer can directly read the status of each joystick switch as being at a logic high (1) or a logic low (0) level. How can a computer read a paddle which may be anywhere between logic high and logic low levels? Before the computer can read a paddle's position, an analog to digital conversion must be performed. The entire range of paddle resistances is subdivided into 256 equal parts. The A/D converter takes the paddle signal and determines a numeric value from 0 to 255 which is proportional to its resistance.

For example, assume that if the paddle is turned counterclockwise, its signal level (or resistance) is low, and when turned completely clockwise, its signal level is high. The A/D converter stores a digital value of 0 in the SID register when the paddle is counterclockwise, and a digital value of 255 when the paddle is completely clockwise. If the paddle is turned halfway between the two extremes, the A/D converter generates the value 128.

The computer can interpret the position of the paddle by the size of this digital value. The paddle's position is determined with a resolution of one part out of 256 parts. Contrast this with the joystick whose position is known with a resolution of only one part out of eight. In electronics jargon, the SID chip contains two 8-bit A/D converters. The eight bits make up one byte, and one byte ranges in value from 0 to 255.

INNER WORKINGS

For those interested in the electronic details of how the analog to digital conversion occurs, have a look at the schematic diagram for the SID chip in the *Programmer's Reference Guide* (page 610 for the C-128 and page 481 for the C-64). The paddles are shown as 470,000 ohm (470 kohm) potentiometers ("pots") coming into the POT X and POT Y inputs of the SID. A 1000 picofarad capacitor is also at each input. One side of the pot goes to +5 volts. The SID chip momentarily brings the top of the external capacitor to ground (0 volts), removing any charge from it. At the same time, it starts an 8-bit binary counter counting fixed-rate pulses. The capacitor then begins charging up through the paddle potentiometer. The smaller the resistance of the pot, the faster the capacitor can charge up. The voltage on the capacitor increases as it charges up.

This voltage comes into a circuit in the SID called a comparator. The comparator compares the voltage on the capacitor with a fixed voltage which is nominally 2.5 volts. When the voltage on the capacitor reaches a value of 2.5 volts, the output of the comparator changes from a low level to a high level. The high level at its output causes the binary counter to stop counting. The value in the counter will be between 0 and 255, depending upon how long it took the capacitor to reach the 2.5 volt level.

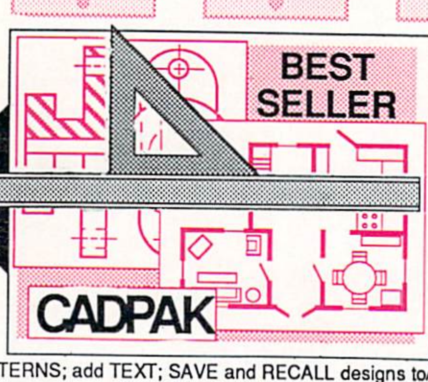
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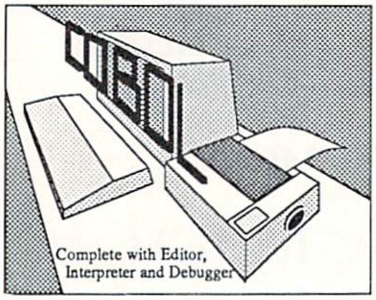
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Reader Service No. 293

When the resistance of the pot is very low, the capacitor reaches the 2.5 volt level very quickly, and the counter is stopped at a very low count. When the resistance of the pot is very high, the counter reaches a very high count before it is stopped.

That's all there is to it. The value in the counter is reasonably proportional to the resistance of the pot. So by reading the value of the counter which is stored in one of the SID's registers, the computer has a digital representation of the paddle's position.

Just a couple more details for the technically oriented. The actual value of the capacitor in the C-128 computer is 1800 picofarads (pF), rather than the 1000 pF shown in the SID schematic. See this for yourself in the computer schematic at the back of your *Programmer's Reference Guide* on page 722. Consequently the maximum useful pot resistance is on the order of 300,000 ohms for the C-128.

SID's two A/D converters are able to handle four paddle inputs by the process of multiplexing. In zone 6D of the schematic diagram on page 726 of the *C-128's Programmer's Reference Guide* is U2, a 4066 electronic switch. This switch selects the inputs from either Control Port 1 or Control Port 2 for conversion. BASIC 7.0 in the C-128 handles the switching, depending upon which paddle input is being read. C-64 users (and assembly language programmers) control the switching by means of bits 7 and 6 of the Complex Interface Adapter at address $DC00.

A DIGITAL OSCILLOSCOPE

With the process of analog to digital conversion understood, let's see how to use it. The program *Digital Scope* for the C-128 on page 106 reads and displays the paddle #1 input (POT X of Control Port 1) in an oscilloscopelike manner. (This program runs only on the C-128. C-64 users must provide routines to read the paddle input and to display the graphics on the screen. We will provide some additional information on this later.)

An oscilloscope (frequently called a "scope") is an electronic instrument that displays a dynamic graph of input signal level versus time. The display on the scope is a cathode ray tube (CRT), which is identical in function to the video monitor attached to your computer. On your video monitor, the electron beam which produces the image is continuously swept from left to right and from top to bottom, producing the thin scan lines (called the raster) on the screen. There is no vertical raster on a normal oscilloscope. Instead, the electron beam is continuously moved from left to right but not from top to bottom.

When there is no input signal to the scope, the electron beam repeatedly moves horizontally from left to right. This produces a horizontal line on the oscilloscope's screen. When it reaches the right edge of the screen, the beam is turned off and is rapidly brought back to the left side of the screen where the sequence is repeated.

The vertical position of the electron beam is controlled by the input signal. When the input signal is large, the beam is near the top of the screen, and when the signal is small, the beam is near the bottom. The screen of the scope actually displays the combination of the vertical and horizontal motions of the electron beam.

For example, assume the input signal is very small when the beam is at the left of the screen and assume that the signal continuously increases. The image on the screen will be a diagonal line running from the lower left of the screen to the upper right. This is just what a graph would look like if you plotted input level on the vertical axis versus time on the horizontal axis. If on the next left-to-right scan of the beam the input signal remains high, the next screen image will be a horizontal line across the top of the screen. If the input signal decreases for a while and then increases again to the maximum during the next scan of the beam, the image on the screen will be "V-shaped." Some experimenting with our digital scope should clarify all this.

EXPERIMENTATION TIME

You need some hardware to perform the following experiments with the digital scope. You should have a nine-pin female D-subminiature connector (such as Radio Shack No. 276-1538 or any other similar part), a potentiometer (any type of about 500k ohms such as Radio Shack No. 271-1723, although any value of at least 10k ohms and any style can be used), and for the optically controlled musical instrument to be discussed later, you need at least one Cadmium Sulfide (CdS) photocell (such as Radio Shack No. 276-116A or 276-1657 or any other typical CdS photocells).

Solder wires at least one foot long to pins 5, 7, and 9 of the nine-pin connector. The numbers are usually visible on the connector itself. In any case, the pins are numbered

1 to 5 from left to right across the top row, and 6 to 9 from left to right across the bottom row when you view the connector from the side to which the wires will be soldered. Refer to the I/O Pinouts in the appendix of your *User's Guide.* That picture looks just like the side of the connector to which you will solder the wires.

If you are even slightly interested in electronics experimentation, I strongly recommend buying a solderless breadboard. Even the smallest ones pay for themselves in convenience very quickly. (A typical device is Radio Shack No. 276-175, although there are many other sources for this and the other parts mentioned.) These breadboards let you make connections between components easily without solder. No serious experimenter is without at least one.

The pins with wires are now:

Pin 5 – POT Y
Pin 7 – +5 volts
Pin 9 – POT X

Connect one end of the pot to the +5 volts wire and connect the middle terminal of the pot (the "wiper") to the wire from pin 9 (POT X). The other terminal of the pot and the pin 5 wire can be left unconnected. If you have a solderless breadboard, the best way to do this is to solder two wires to the pot terminals, and plug these wires into the breadboard. Then plug the wires from the connector into the breadboard. (For those unfamiliar with the breadboard, the five holes in each vertical line are internally connected so that up to five wires can be joined together simply by plugging them all into vertically adjacent holes.)

THE SOFTWARE

The *Digital Scope* program turns the C-128 into the world's slowest digital oscilloscope. On the plus side, it is no doubt the world's least expensive digital oscilloscope. The program uses the 320 by 200 high-resolution display (GRAPHIC 1). There are numerous features built in, and you can easily modify these and add your own.

Among the features of this oscilloscope are adjustable gain (vertical size), adjustable vertical position, offscreen image locators, dual traces (two parameters displayed simultaneously), freeze-frame (pause control), and running average display.

Line 70 sets the high-resolution graphics mode and clears the screen. Line 80 sets the initial gain G which converts the 0 to 255 range of the A/D into a 0 to 190 range to fit onto the graphics screen. Increasing G is equivalent to magnifying the vertical size of the image. VY in line 90 is the vertical offset of the image. Increasing VY moves the image higher up on the screen. Line 100 prints the Y value to be plotted on the screen. If this number is outside the range of 0 to 200, the image is off the screen. This value is printed on the default text screen, not on the graphics screen. It is for reference only.

The main loop starts at line 110. The horizontal X value is defined by the FOR/NEXT loop. The vertical Y value is calculated in line 130. The computer reads the value of POT AX plugged into Control Port 1 (paddle #1). The input value is multiplied by G and added to VY to determine the corresponding screen value. The result is subtracted from 200 so that a vertical screen value of 0 is at the bottom of the screen, and 200 is at the top. Line 140 puts the dot on the screen.

The routine beginning at line 150 calculates a running average of the previous MAX number of readings. MAX is defined in line 40. A second trace is shown on the screen corresponding to this averaged (filtered) value. It is displayed as a separate trace above the current input value on the screen.

This averaging routine is the most sophisticated part of the program. The plotted Y values are kept in a circular buffer YV( ) consisting of MAX elements. The pointer PTR cycles from 0 to MAX-1. At line 160 the pointer is updated to point to the oldest element in the buffer. The sum of all the values in the buffer is kept in SUM. In line 170, the oldest value in the buffer is subtracted from SUM and the current value of Y is added. Then the current value of Y is put into the buffer, replacing the oldest value. The running average is the sum of the values in the buffer SUM divided by the number of items in the buffer MAX. This is calculated in line 190, and in line 200 it is plotted 50 units above the actual input value.

The short routine at line 210 decides if the point to be plotted is on or off the screen. If it is on, it is plotted. If it is outside the range of 0 to 200, an arrow appears either at the top or bottom of the screen showing where the image is. You may use the adjustment keys discussed below to bring the image back onto the screen.

The keyboard is checked after each horizontal position is plotted. If no keys are pressed, the next value of X is chosen in line 250. When X reaches 320 at the right side of the screen, the screen is cleared in line 260 and the next scan begins at the left side of the screen in line 120.

If a key has been pressed, execution continues at line 290. The keystroke is stored in A$. The valid keystrokes are stored in the string which is the first argument of the INSTR function. K is given a value corresponding to the position of A$ within the valid keystroke string. If a key is pressed which is not in the list, the value of K is 0 and execution continues normally. If a valid key is pressed, the appropriate subroutine is called in line 310. After returning from the subroutine, the program branches back to its proper place.

The valid keystrokes are <CURSOR UP> and <CURSOR DOWN> to move the image vertically on the screen; "+" and "–" to increase or decrease the gain (vertical magnification); "C" to Clear the screen and start the scan again from the left leaving all other parameters intact; "P" to Pause the display (any other key will continue the display); and "Z" to Zero or "reinitialiZe" the gain and vertical position parameters to their original values and to restart the trace. The RUN STOP key stops the program. If you break the program to change it, you may restart by typing GOTO 120 without reinitializing all the parameters.

Lines 20, 1000, and 1010 set up error-trapping. If an error occurs when a point is to be plotted off the screen, the program just continues with the next statement because of the RESUME NEXT in line 1010. When you use error trapping, the RUN STOP key no longer works. To let RUN STOP actually stop the program, a statement such as the one in line 1000 is needed. Error number 30 corresponds

to the RUN STOP key being pressed. If that is the case, the program ends. You may want to omit line 20 initially until you have all the SYNTAX ERRORs out of your typed-in program.

Commodore 64 users have more of a task ahead of them, although it should be enjoyable and worthwhile. You must provide a high-resolution bit-map routine to plot a point at position X,Y. A routine to do this was presented in the April 1986 edition of the *Rupert Report.* You must modify the keyboard routine of the program if dynamic input is desired.

Also, C-64 users must provide a routine to read the paddle values. A complete routine is listed on page 347 of the *C-64 Programmer's Reference Guide.* Paddle #1 and Paddle #2 (Control Port 1) can be read with the commands: P1 = PEEK(54297) : P2 = PEEK(54298). The C-64 manual says that paddles cannot be read reliably from BASIC, although it seems that the main problem is with the reading of paddles in Control Port 2.

Run this program (on the C-64 or the C-128) to display the paddle values from Control Port 1:

```
1 PRINT PEEK(54297),PEEK(54298)
2 GOTO 1
```

This gives generally consistent results on the C-128 in C-64 mode, with just a few glitches.

THE POSSIBILITIES

There are countless ways of using this program. Experiment with changing the running average buffer length to see how more or less filtering of the input affects the output. If you put a switch in line with one side of the potentiometer, you can generate square waves by periodically opening and closing it (or simply connect and disconnect the wire to the pot).

Look at the filtered waveform to see how this low-pass filter converts a square wave into a triangle wave. You will see that if the switch is operated quickly enough, the filtered output can't keep up with the input changes, and it reaches a constant level. This is low-pass filter theory right before your very eyes! A nice thing about this simulation is that it all happens at a speed which is easily comprehended by human minds. The snail's pace of BASIC is a benefit here.

You could rig up a simple spring and lever mechanism to the shaft of the potentiometer in order to measure force or displacement. It would not require much effort to turn this program into a data-logger which stores the incoming data for future reference and interpretation. Your computer with its A/D converter is a laboratory in itself.

MAKING MUSIC

One of the more entertaining uses of this program that I have found is to replace the potentiometer with a Cadmium Sulfide photocell described earlier. The photocell acts like an optically controlled potentiometer. Increasing the amount of light on the photocell decreases its resistance and vice versa.

Add this line to the program:

```
205 SOUND 1,20000 - Y*100,2
```

Now you can change the pitch of the sound with your hand simply by covering and uncovering the photocell. The graphic display of the oscilloscope will still respond, adding a light show to this simple opto-organ. The Theremin is a registered trademark for a musical instrument which also is controlled by the movement of the player's hands. It uses body capacitance rather than light to change the pitch and volume of the music. There is something magical about playing music by simply waving your hands. Children are as fascinated by this ability as adults are.

It is very easy to add another photocell to control volume using the VOL command. For some very exotic effects, change line 205 above to let the photocell control other properties of the sound such as sweep, waveform, and pulse width. With as many as four independent photocells controlling numerous sound and screen parameters, you could create a synthesized orchestra and light show controlled by just your fingertips.

We have barely begun to explore the possibilities for using the A/D converters in the Commodore computers. No doubt many readers will not bother to buy the few components needed to begin experimenting. Those of us who do bother will know what the others are missing. Let me know of some of the applications you come up with. We will have other A/D adventures in future issues. ☐

SEE PROGRAM LISTING ON PAGE 106

THE FASTEST DRAW IN THE INDUSTRY

Techniques Professional Programmers Use To Write Super Fast Assembly Language Programs

By Mark Andrews

We all know how fast machine language is—and now we're going to learn how to make it even faster. This month we'll reveal some of the secrets that professional programmers use when they want to write super fast assembly language programs.

Over the past few months, we've seen how hopelessly inadequate BASIC is as a tool for writing high-resolution graphics programs. Last month we translated one hi-res BASIC program into assembly language and saw how much faster it ran. Now we're going to soup up last month's program so that it runs even faster. And by the time we're finished, we'll have it running at real machine language speed.

IMPROVING THE HRDEMO.S PROGRAM

Last month's program was called HRDEMO.S, and this month's revision is called RECTANGLE.S. HRDEMO.S didn't do much; it merely drew a big empty square on a high-resolution screen. RECTANGLE.S, as its name implies, performs a similar function: it will draw either a square or a rectangle on the screen, and it will do the job much, much faster than its predecessor. In addition, it lets the programmer control the dimensions and the size of the rectangle, and even gives him control over where the rectangle will be displayed on the screen.

RECTANGLE.S, like HRDEMO.S, was written using a *Merlin 64* assembler and is designed to run on a Commodore 128 in 40-column high-resolution mode. With minor modifications, the program can be typed and assembled using any other assembler compatible with a C-128, and it can also be altered quite easily to run on a Commodore 64. The techniques needed to make these changes have been explained in previous columns, and are also discussed in my book *Commodore 64/128 Assembly Language Programming*, published by Sams.

PLOTTING A RECTANGLE

The RECTANGLE.S program appears on page 104. When the program has been typed, assembled, and saved on a disk, it can be called and executed using RECTANGLE.BAS, the BASIC program following it at the bottom of page 105.

To control the size, dimensions, and location of the rectangle drawn by the two programs, all the C-128 user has to do is change the values of the variables in lines 30 through 60 of the RECTANGLE.BAS program. The variables HST and HND are used to set the starting and ending points of the horizontal lines that are used to draw the rectangle. The starting and ending points of the rectangle's sides are determined by the variables VST and VND. So, by changing the values of these four variables, the user can choose the shape, size, and location of the rectangle displayed on the C-128's 320 dot by 200 line hi-res screen.

WHY 'RECTANGLE.S' IS FASTER

There are two main reasons why RECTANGLE.S runs so much faster than HRDEMO.S. For one thing, it doesn't have to perform as many calculations each time it plots a dot on the screen. For another, a number of the major calculations it does perform are shorter and faster.

GENERATING A BIT-MAPPED DISPLAY

To understand what has made these improvements possible, it's necessary to have some understanding of how the C-128 produces hi-res screen graphics in its 40-column mode. So here's a brief review of some facts that appeared in last month's column, together with some new information that has never, to my knowledge, appeared in print:

As you may recall from last month's column, each dot on the C-128's hi-res screen reflects the state of one bit stored in RAM. If the data bit that controls a screen dot is set to 1, its corresponding dot on the screen will be lit. But if the same bit is cleared to 0, its corresponding dot will be dark.

The bits that control the dots on the screen are all stored in a block of memory called a *screen map.* And the technique used to generate a display from a screen map is called *bit-mapping.* (There is another screen map used to control the *color* of each dot on the screen, but we won't get involved in that in this column.)

The bit map used to generate the screen in RECTANGLE.S begins at memory address $2000, or 8192 in decimal. It is labeled SCRBAS (for "screen base") in line 19, and is referred to by that label throughout the program.

HOW BIT-MAPPING WORKS

There are 64,000 dots on a 40-column high-resolution screen, so it takes 64,000 bits – or 8000 bytes – of memory to store a screenful of bit-mapped data. But, as you may recall from last month's column, the order in which these 8000 bytes are stored in memory is very different from the order in which they are displayed on the screen.

In memory, the bytes used to create a screen map are simply stored in consecutive order, beginning with byte 0 and ending with byte 7999. But when the C-128 generates a video display, it divides the screen up into a grid of 1000 rectangles, each containing eight bytes. The eight bytes that make up each rectangle are stacked one on top of the other, like pancakes. And the 1000 eight-byte rectangles on the screen are arranged into a matrix that is 40 columns wide by 25 columns high – exactly the same arrangement that the C-128 uses to generate a 40-column text display.

This kind of screen layout makes it very easy to program a text display, since the eight-byte rectangle used to form each character displayed on the screen in the C- 128's text mode can be fetched from eight consecutive bytes in memory. But when the C-128 is in 40-column high-resolution mode, bit-mapping a dot on a screen becomes considerably more complicated. To plot a dot on a hi-res screen, a program must carry out three separate operations. First, the eight-byte rectangle in which the dot appears must be located. Then the byte (or *line*) inside that rectangle in which the dot appears must be determined. Finally, the dot's position in the *byte* in which it appears must be pinpointed. Only then can the dot be plotted on the screen.

Before any of the above operations can be carried out on a given dot, however, the dot's exact position on the screen must be determined. Since there are 40 columns of rectangles on the screen, and since there are eight horizontal dots in each column, there are 320 horizontal positions on the screen in which a dot can appear. So the horizontal position of each dot on the screen can be determined by using a set of 320 horizontal coordinates, or *X-coordinates,* which are usually numbered from 0 to 319.

Going down the screen, there are 25 rows of eight-byte rectangles. So the vertical position of each dot on the screen can be determined by using a set of 200 vertical coordinates, or *Y-coordinates,* which are usually numbered from 0 to 199.

DOT-PLOTTING FORMULAS

The first step in converting a dot's screen location into its corresponding bit in memory is to divide the dot's vertical coordinate, or Y coordinate, by 8. The result of this operation will be the row number of the eight-byte rectangle in which the dot appears. The calculation can be performed using the following formula:

```
ROW = INT(Y/8)
```

Next, the dot's horizontal position, or X coordinate, must also be divided by 8. The result of this operation will be the column number of the eight-byte rectangle in which the dot appears. The formula used can be written:

```
COL = INT(X/8)
```

When the two operations above have been carried out, the dot's horizontal position within its eight-byte rectangle must be calculated. This formula will do that job:

```
LINE = Y AND 7
```

When all that's done, a formula like this can be used to bring all the previous formulas together and calculate the position of the byte in which the desired dot appears:

```
BYTE = ROW * 320 + COL * 8 + LINE + BASE
```

HOW IT WORKS

As in the previous formulas, the variable ROW in the above formula represents the horizontal row in which the rectangle that contains the dot appears, and the variable COL represents the vertical column in which the rectangle is situated. BASE represents the starting address of the screen map being used, and LINE represents the line number of the desired byte on a 200-line high-resolution screen (with the lines numbered 0 through 199). The ROW variable is multiplied by 320 because there are 320 dots in a screen line, and the COL variable is multiplied by 8 because there are eight lines of bytes in each screen rectangle.

ONE LAST DETAIL

After this last calculation has been carried out, one complicating factor still must be taken care of. The complication is that the eight bits of data which form each byte on the screen are also arranged in a different order in RAM from the order in which they appear on the screen. In memory, the bits that make up a byte are arranged from right to left. But on the screen, the eight dots that make up a byte are arranged in just the opposite order: from left to right.

Because of this complication, one last formula must be used to reverse the positions of the bits in a byte so that they will appear in the proper order when they are displayed on the screen. This formula is often written this way:

```
BIT = 7 - (X AND 7)
POKE BYTE, PEEK(BYTE) OR 2^BIT
```

ON WITH THE PROGRAM

Now that we know how a dot's position on a screen can be converted into its corresponding position in RAM, we're ready to see exactly how this month's RECTANGLE.S program differs from the HRDEMO.S program described in this space last month. The most important difference is this: Every time HRDEMO.S plotted a dot, it used the series of formulas presented above to calculate the dot's position on the screen. But RECTANGLE.S does not perform every

single one of those calculations every time it plots a dot; instead, it consults something called a *Y-lookup table* and simply *looks up* the starting address in RAM of the screen line on which the desired dot appears. The program then calculates the dot's horizontal coordinate, or *X-offset,* and adds it to the Y-coordinate address which it has found in its Y-lookup table. And the result of this calculation is the dot's address in RAM. This procedure considerably reduces the number of calculations that must be carried out to plot a dot on a screen and can significantly increase the operating speed of a program.

The Y-lookup table used in RECTANGLE.S is set up in lines 97 through 141. As the table is created, it is stored in a block of memory that begins at memory address $8000.

Actually, two tables are set up in this section of the program; the low byte of each Y address is stored in a table that starts at memory address $8000, and the high byte of each Y address is stored in a second table that begins at $8100. This may sound like a strange way to set up an address table, but it makes good sense, since the same offset that is used to fetch the high byte of a Y address can also be used to fetch the low byte.

A CLOSER LOOK

Now let's take a closer look at how a Y-lookup table works. First, the 8502 Y register is used to create a loop in which the starting address of each line on the screen is loaded into the accumulator, beginning with line 0 and ending with line 199.

In lines 106 through 110, each line number is divided by eight to pinpoint the row of eight-byte rectangles in which the dot appears. But this division is carried out in a streamlined way, not in the slow old-fashioned way that was used in last month's program. Instead, each time a line number is loaded into the accumulator, each bit of the number is moved three places to the right using three LSR (logical shift right) instructions. Since the bits in a binary byte progress from right to left in powers of two, the easiest way to divide a bit by 2 is to shift each bit in the byte one place to the right. Shifting each bit two places to the right is equivalent to dividing the bit by 4, a three-bit shift to the right is the same as dividing by 8, and so on. So three shifts to the right are used to divide the contents of the accumulator by 8 in the RECTANGLE.S program.

In lines 112 through 126, the row number that has just been calculated is multiplied by 320 using a multiplication subroutine that appears in lines 77 through 95. This routine looks much like the 16-bit multiplication subroutine that appeared in the HRDEMO.S program last month, but a close comparison will show that it's a few bytes shorter. And every little bit (or byte) helps when you're trying to speed up a program.

After each row number has been multiplied by 320, the product is added to the starting address of the screen map, and the sum is stored in the low-byte and high-byte lookup tables that start at $8000 and $8100. This procedure continues until both tables have been filled in.

After the program has created its Y-lookup table, it moves on to the process of drawing a rectangle on the screen—with the help, of course, of values POKEd in during the execution of the RECTANGLE.BAS program. When the necessary values have been POKEd in, the program first calculates the X offset that must be used to display each dot. It performs this calculation in much the same way that last month's program did. But then, in lines 293 through 300, it looks up the starting address of each screen line. Finally, it adds each Y line address to the appropriate X coordinate with the help of indirect (Y-register) addressing, and thus determines the location of the byte in which each desired dot appears.

ANOTHER SHORTCUT

Still another tricky shortcut is used in lines 308 through 310 of RECTANGLE.S. In these lines, the equation

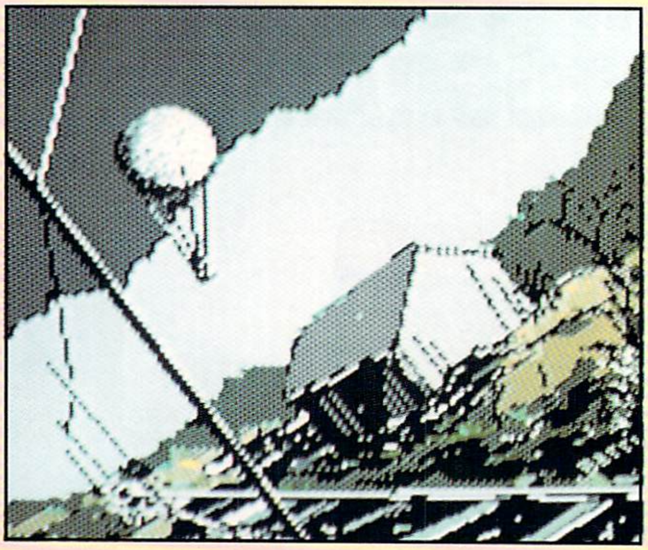
```
BIT = 7 - (X AND 7)
```

is solved by using another table—a very short one that appears in line 52. Since the purpose of this formula is to reverse the order of the bits in a byte before displaying the byte on a screen, the solving of the equation can be speeded up significantly by dispensing with calculations altogether and resorting to the use of a table. I'll leave it up to you to figure out why.

Now you know how to draw lines and rectangles on a high-resolution screen at speeds matching those achieved in commercial-grade graphics programs. Next month we'll reveal some more tricks of the trade and see how joysticks, paddles, and mice can be used to control fast-action graphics on a high-resolution screen. □

SEE PROGRAM LISTINGS ON PAGE 104





Art Gallery Disk Sale

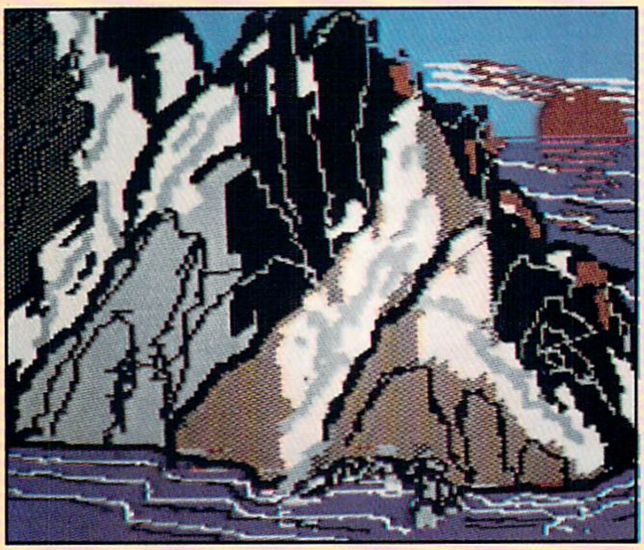
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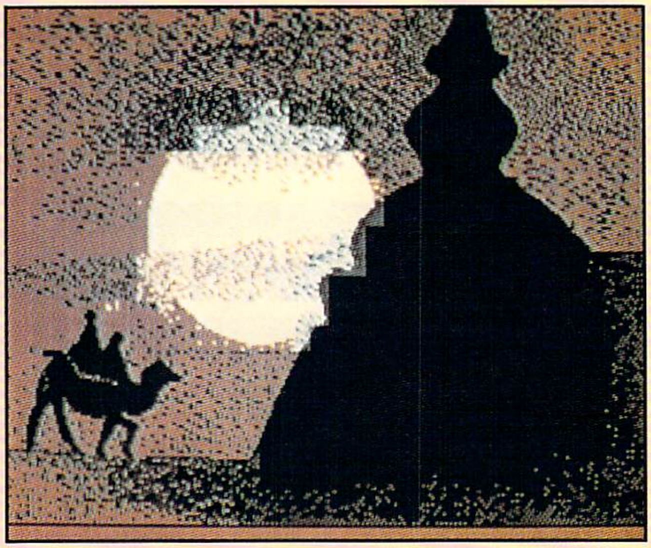
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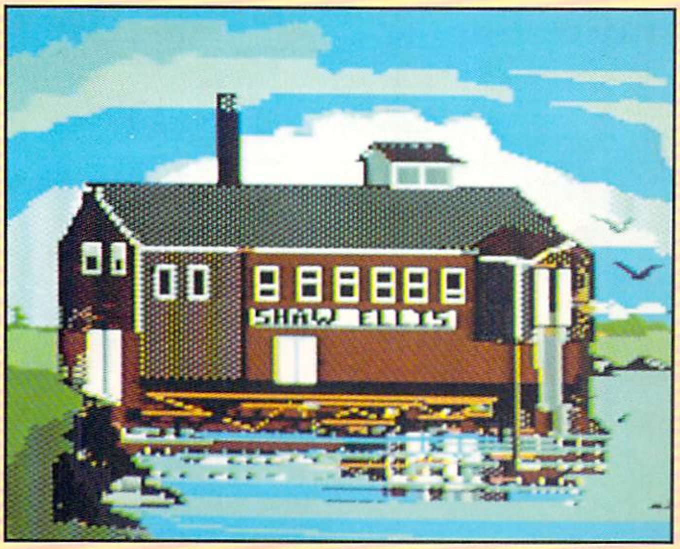
Note that the *Art Gallery* is not a contest. Published pictures are selected in an arbitrary and capricious fashion by the *Ahoy!* Art Director based solely on the artistic merit of the individual images.

As we write these words in late July, our thoughts naturally turn to all the places we're too busy putting out *Ahoy!* to vacation to. But we can do the next best thing, and wing around the world via an *Art Gallery* travelogue. Hovering directly above is Barri Olson's *Balloon,* rendered by the Madison, WI artist on the Koala Pad with *Koala Painter* software. The same artistic tools were employed by Alberto Valsecchi (Milano, Italy) in the creation of *Lake* at right—a masterpiece that does his Renaissance ancestors proud. At bottom left is *Rocks* by Earl Hamner (Milpitas, CA). Beside it is *Heiching* by Ma Luo (Winnipeg, Manitoba), created with *Flexidraw.* Following our noses to the right, we find the *Shaw & Ellis Clam Canning Factory* by Robert M. Ellis (Quebec, ONT), drawn from his memories of Pocologan, a small fishing village in New Brunswick. At far right (or Far East) is another by Ma Luo: *Qingzhao.*







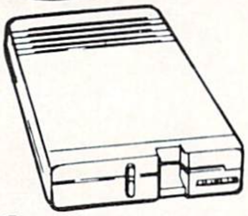



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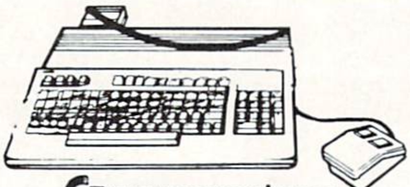




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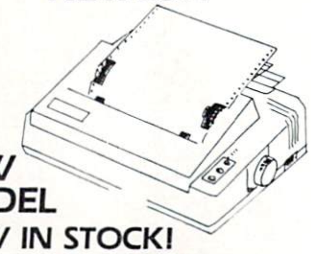
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Compiled by Michael R. Davila

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COMAL 0.14 FAST DUMP

I have good news for all the owners of Commodore 1525/MPS 801 printers! I've written a screen dump program that will dump a COMAL 0.14 high resolution screen in about 2½ minutes. It is short, fast, and easy to use. First, type in and save the BASIC loader program. Second, load and run the BASIC loader program to install the machine language program into a safe spot of memory. Last, load your copy of COMAL 0.14 and run it as usual. That's it! When you are ready to dump a screen, make sure the printer is turned on and the paper is adjusted correctly. Then enter this command: SYS 52736 <RETURN>. The picture will be printed sideways in about 2½ minutes. If you've ever used a BASIC screen dump (over an hour) or a COMAL version (about 25 minutes), you'll really like the speed improvement this program makes. The SYS command can be entered from within a running program or from the keyboard. It resides in the RS-232 buffer area ($CE00-$CFFF), so it shouldn't be affected by any normal programs that you write.

—Mark S. Lewis
Odessa, TX

```
·10 I=52736
·20 READ A
·25 IF A=256 THEN 40
·30 POKE I,A:I=I+1:GOTO20
·40 END
·52736 DATA 169,80,32,144,255,24,169,4
·52744 DATA 160,7,162,4,32,186,255,169
·52752 DATA 0,32,189,255,32,192,255,144
·52760 DATA 1,96,162,4,32,201,255,144
·52768 DATA 1,96,169,8,32,210,255,169
·52776 DATA 0,141,178,207,141,179,207,169
·52784 DATA 199,141,183,207,169,0,141,177
·52792 DATA 207,169,0,141,166,207,24,173
·52800 DATA 178,207,109,166,207,141,180,207
·52808 DATA 173,179,207,105,0,141,181,207
·52816 DATA 173,180,207,41,7,141,182,207
·52824 DATA 45,166,207,240,3,76,253,206
·52832 DATA 173,183,207,41,248,141,167,207
·52840 DATA 169,0,141,168,207,173,167,207
·52848 DATA 24,42,46,168,207,42,46,168
·52856 DATA 207,42,46,168,207,141,185,207
·52864 DATA 173,168,207,141,186,207,173,185
·52872 DATA 207,42,46,168,207,42,46,168
·52880 DATA 207,24,109,185,207,141,185,207
·52888 DATA 173,168,207,109,186,207,141,186
·52896 DATA 207,169,248,45,180,207,141,187
·52904 DATA 207,169,1,45,181,207,141,188
·52912 DATA 207,173,183,207,41,7,141,184
·52920 DATA 207,173,164,207,141,167,207,173
·52928 DATA 165,207,141,168,207,24,173,185
·52936 DATA 207,109,167,207,141,167,207,173
·52944 DATA 186,207,109,168,207,141,168,207
```

```
•52952 DATA 24,173,187,207,109,167,207,141
•52960 DATA 167,207,173,188,207,109,168,207
•52968 DATA 141,168,207,24,173,184,207,109
•52976 DATA 167,207,141,167,207,169,0,109
•52984 DATA 168,207,141,168,207,173,167,207
•52992 DATA 133,251,173,168,207,133,252,120
•53000 DATA 165,1,141,189,207,169,53,133
•53008 DATA 1,160,0,177,251,141,190,207
•53016 DATA 173,189,207,133,1,88,56,169
•53024 DATA 7,237,182,207,168,185,169,207
•53032 DATA 45,190,207,141,184,207,56,173
•53040 DATA 184,207,233,1,144,13,172,166
•53048 DATA 207,185,169,207,24,109,177,207
•53056 DATA 141,177,207,173,166,207,201,6
•53064 DATA 240,6,238,166,207,76,62,206
•53072 DATA 24,173,177,207,105,128,32,210
•53080 DATA 255,173,183,207,208,3,76,103
•53088 DATA 207,206,183,207,76,52,206,169
•53096 DATA 13,32,210,255,173,178,207,201
•53104 DATA 59,208,10,173,179,207,201,1
•53112 DATA 208,3,76,145,207,24,173,178
•53120 DATA 207,105,7,141,178,207,173,179
•53128 DATA 207,105,0,141,179,207,76,47
•53136 DATA 206,169,15,32,210,255,169,13
•53144 DATA 32,210,255,169,4,32,195,255
•53152 DATA 32,204,255,96,0,224,0,0
•53160 DATA 0,1,2,4,8,16,32,64
•53168 DATA 128,0,0,0,0,0,0,0
•53176 DATA 0,0,0,0,0,0,0,256
```


REPROGRAMMING THE 128 HELP KEY

If you think the HELP key on the Commodore 128 is for wimps, good news: you can reprogram it. The method is a little more complicated than the KEY command, but not much. Set A$, in line 10, to any BASIC 7.0 keyword or series of keywords. If immediate execution is desired include CHR$(13) in the manner shown. The HELP command is still available by typing it in direct mode.

—Ed Horgan
Coatesville, PA

```
10 A$="GOTO50000"+CHR$(13)
20 FOR I = 4106 TO 4339
30 IF PEEK(I)=72 AND PEEK(I+3)=80 THEN A=I
40 NEXT
50 J=1
60 FOR I = A TO A+LEN(A$)
70 POKE I,ASC(MID$(A$,J,1)):J=J+1
80 NEXT
90 POKE 4105,LEN(A$)
```

STRINGING MACHINE CODE ROUTINES

At times it is convenient to stash short machine language routines within a BASIC program to avoid conflicts, or to leave the customary memory areas free for other uses. The program segment shown here allows a machine code routine shorter than 256 bytes to be housed within a BASIC program in such a way as to be visually readable, LISTable, EDITable, SAVEable, LOADable, and executable with no problems. It requires no DATA statements, so it does not interfere with normal use of BASIC's RESTORE command. The example code shown is the "RESTORE LN" routine by Bob Renaud published in the March '86 *Ahoy!*

Three-digit decimal machine code bytes separated by a single space are typed into strings D1$, D2$, D3$, etc. Upon running the program, the code numbers are sequentially concatenated into string MC$ by Line 200 and the subroutine in Lines 140 and 150. At any time thereafter the DATA pointer can be restored to any desired line number by a program line like line 240. This equates MC$ to itself to ensure that its text is at the bottom of the active strings area at the moment of use, so its address can be found by PEEKing locations 51 and 52. The routine is executed by a SYS call to that address, followed by a comma and the target line number.

—C.C. Stalder
Waynesville, NC

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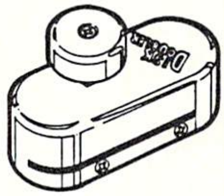
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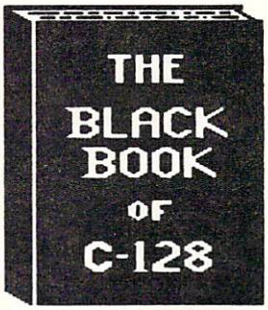
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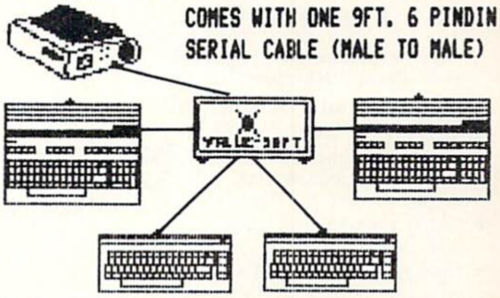
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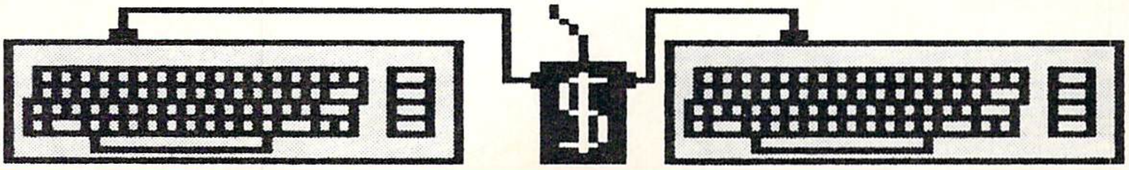


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```
100 REM "STRINGIT" PUT M.C. ROUTINE IN A
CTIVE STRING WITHOUT DATA STATEMENT USE
110 :
120 GOTO170:REM JUMP PAST SUBROUTINE
130 :
140 FOR N=1 TO LEN(D0$) STEP4:MC$=MC$+CH
R$(VAL(MID$(D0$,N,3))):NEXT
150 FR=FRE(0):RETURN
160 :
170 D1$="165 020 072 165 021 072 032 253
 174 032 138 173 032 170 177 133 021"
180 D2$="132 020 032 019 166 165 095 133
 065 165 096 133 066 104 133 021 104"
190 D3$="133 020 056 165 065 233 001 133
 065 165 066 233 000 133 066 096"
200 D0$=D1$:GOSUB140:D0$=D2$:GOSUB140:D0
$=D3$:GOSUB140:END
210 :
220 REM A LINE LIKE THE FOLLOWING RESTOR
ES DATA POINTER TO SPECIFIED LINENUMBER
230 :
240 MC$=MC$:FR=FRE(0):TP=PEEK(51)+256*PE
EK(52):SYS TP,<LINENUMBER>
```

IT'S STILL RELATIVE

As most people are aware by now, the Commodore 128 has a "bug" in its ROM which prevents the pixel cursor from being offset, in a negative direction, relative to its previous location. You are supposed to be able to put a plus or minus sign in front of an X or Y coordinate in the BOX, CIRCLE, DRAW, LOCATE, PAINT, SSHAPE, and GSHAPE commands to move the pixel cursor relative to its last location. But, if you use a minus sign, an "ILLEGAL QUANTITY ERROR" is generated. However, there is an undocumented form of relative pixel cursor placement which will work with all of the above commands. (It is described in the *System Guide*, but only for option #3 of the MOVSPR command.) Whenever a coordinate is called for in the commands named above, you may substitute a distance from the current pixel location along a specified angle by separating the numbers with a semicolon instead of a comma. For example,

```
GRAPHIC 1,1:DRAW 1,45,100 TO 100;90 TO 1
30;310 TO 104;180 TO 120;90 TO 50;235 TO
144;270 TO 50;305 TO 106;90
```

will draw a very crude rendition of a sailboat. Experiment; I think you will find it to be a useful addition to your programming arsenal. —Rick Rothstein
Trenton, NJ

EXPRESS YOURSELF WITH RESTORE

According to the Commodore 128 *System Guide*, the RESTORE command can have a line number after it to determine which DATA statement is read next. What the *Guide* doesn't say is this line number need not be a simple numerical constant, but rather can be any valid mathematical expression! For example, consider

```
RESTORE 100 + 10 * EX
```

where EX is an expression composed of any correctly posed combination of string and numeric functions that equates to integer values. If EX=0, then the DATA statement at line 1000 would be RESTOREd; if EX=1, then line 1010 would be RESTOREd; and so on. As it turns out, the RENUMBER command will work correctly with these mathematical expressions provided the first value in the expression is a constant which represents a valid line number. In the above example, RENUMBER would change the constant 1000 to the same number that line 1000 becomes. However, RENUMBER will not look beyond the first constant it finds; so changing the line number increments will probably invalidate the RESTORE expression. —Rick Rothstein
Trenton, NJ

PRINT DOLLARS AND CENTS

Commodore 64 programmers do not have the handy PRINT USING command, one of the commonest tasks of which is to convert a numeric variable into a string for printing in dollars and cents format—a job that can be done quite nicely by this two-line subroutine:

```
1000 R$=STR$(INT(Q*1000+(SGN(Q)*5))):L=L
EN(R$)
1010 R$="$"+LEFT$(R$,L-3)+"."+MID$(R$,L-
2,2):RETURN
```

Put the number in variable Q, do GOSUB 1000, and the formatted number is returned in string variable R$, ready for printing. The subroutine can handle any positive or negative number that contains (or that rounds to a dollars and cents figure which contains) no more than eight digits plus the decimal point. —C.C. Stalder
Waynesville, NC

COMSTOP

This IRQ routine stops the operating system for an indefinite amount of time dependent on the pressing and holding the Commodore key. This is useful if you don't have a printer (or do) and want to look at a program or directory listing. Just load *Comstop* and type SYS 828 and you are ready to continue. This routine cannot be relocated in the present form. —Stephen J. O'Connor
Lake In The Hills, IL

```
•90 REMSAVE"@0:COMSTOP",8:VERIFY"@0:COMST
OP",8
•95 REM PROGRAM BY STEPHEN J. O'CONNOR
•100 FORI=828TO861:READA:CK=CK+A:POKEI,A:
NEXT
•105 IFCK<>4152THENPRINT"[CLEAR][8"[RIGHT
]"][RVSON]ERROR IN DATA STATEMENTS":STOP
•110 SYS828:PRINT"[CLEAR][12"[RIGHT]"][RV
SON]-COMSTOP ENABLED-"
•115 PRINT"[DOWN][10"[RIGHT]"]SYS 828 TO
RE-ENABLE.":NEW
•120 DATA120,169,073,141,020,003
•125 DATA169,003,141,021,003,088
•130 DATA096,165,211,208,014,032
•135 DATA159,255,240,251,173,141
•140 DATA002,201,002,208,002,240
•145 DATA242,076,049,234
```


WEDGE-O-MATIC

Ever want to bring up the directory without destroying what's already in Ol' Reliable's memory? Don't have a program that'll do this little goodie for you? Give *Wedge-o-Matic* a try. It's easy to use and works with both the 64 and VIC 20.

First load and run *Wedge-o-Matic*. Now you can load, save, and run all the programs you want (providing they don't POKE data into the cassette buffer). Whenever you want to view the directory, type SYS 828 and press RETURN. Bingo, the directory appears without launching your current program into oblivion. If you want to exit *Wedge-o-Matic* before it has finished listing the directory, press the STOP key.

As listed, *Wedge-o-Matic* works on the 64. If you're using a VIC 20, remove the REM in line 48 (just the REM statement, not the whole line). Now *Wedge-o-Matic* will automatically make the necessary POKE to become VIC 20 compatible.

—Buck Childress
Salem, OR 97309

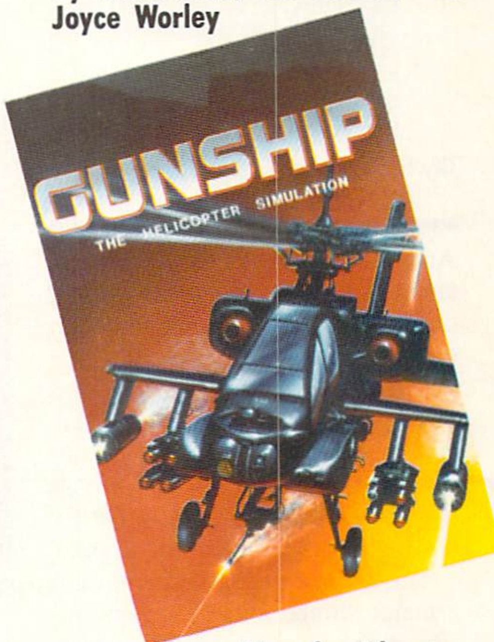
```
•10 PRINTCHR$(147)"LOADING":PRINT
•20 FORJ=828TO923:READA:POKEJ,A:X=X+A:NEX
TJ
•30 IFX<>14168THENPRINT"ERROR IN DATA[3".
"]":END
•40 REM POKE900,221
•50 PRINT"DATA OK":PRINT:PRINT"SYS 828 TO
 USE[3"."]":END
•60 DATA169,147,32,210,255,169,36,133,251
,169,5,162
•70 DATA8,160,0,32,186,255,169,1,162,251,
160,0
•80 DATA32,189,255,32,192,255,162,5,32,19
8,255,32
•90 DATA228,255,32,228,255,32,228,255,32,
228,255,32
•100 DATA228,255,72,32,228,255,168,104,17
0,165,144,240
•110 DATA8,32,204,255,169,5,76,195,255,15
2,32,205
•120 DATA189,169,32,32,210,255,32,225,255
,240,234,32
•130 DATA228,255,208,243,169,13,32,210,25
5,76,101,3
```

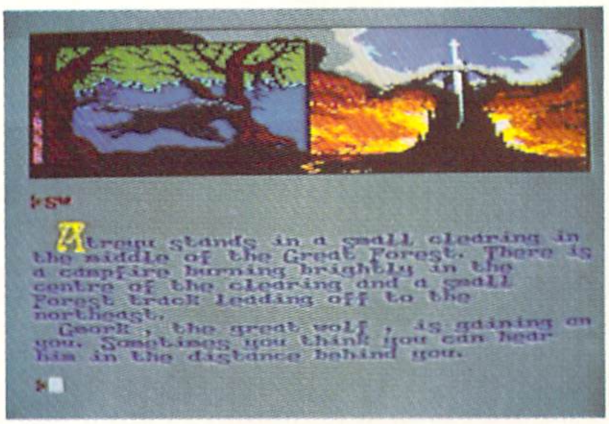
CHRISTMAS '86 ENTERTAINMENT SOFTWARE PREVIEW

These are the games we'll be giving and getting this holiday season.

By Arnie Katz, Bill Kunkel, and Joyce Worley







PartyWare *(top left) generates personalized banners, hats, cards, etc.*
READER SERVICE NO. 268

Gunship *(top right) simulates the peril-paved flight of an Apache copter*
READER SERVICE NO. 269

The NeverEnding Story *(bottom) teams kid-venturers with Falkor the dragon.*
READER SERVICE NO. 270

The supply of new game and recreational software slowed to a trickle during the first half of 1986. Things are looking a lot brighter for this fall and winter, however. Publishers have stepped up their new program introductions in response to strong Commodore 64 and 128 sales.

There never seem to be enough entertainment programs for the Commodore. That makes the new crop, expected to reach stores in time for Christmas and Chanukah giving, especially welcome.

Some of the recommendations listed below have been mentioned in recent installments of *Scuttlebutt*; most are announced here for the first time. All should contribute to a festive holiday season.

Time for Adventure

Fantasy role-playing games allow the computerist to create characters and guide them through a series of experiences. Although there's generally a plot which serves as a framework, there's usually a lot of room to wander, explore, and get into mischief. Among new fantasy role-play disks are two sequels to game-systems which made their debuts earlier this year.

Now *Alternate Reality* fans can find out what lurks beneath the city in *Alternate Reality: The Dungeon* (Intellicreations/Datasoft). The gamer can take high-level characters into a four-level labyrinth to fight monsters and gain fabulous treasures.

Bard's Tale II: The Arch-Mage's Tale (Electronic Arts) has seven cities and a new character class, the



Toy Shop ***creates 20 working models.***
READER SERVICE NO. 271

Arch-Mage with a book of 30 incantations. Characters generated with the original program can continue their exploits here.

Fairlight (Mindscape, $29.95) is a three-dimensional role-playing fantasy game with breathtaking visuals. The beautiful kingdom has lost its magic. It can only be restored if a hero retrieves the Book of Light.

The literary quality of the prose is a major strong point of several text adventures coming soon. If an adventure game has nothing but text on the screen, let it always be as luminous as in *Thomas M. Disch's Amnesia* (Electronic Arts, $39.95). Science fiction author Disch worked closely with the Cognetics design team to produce a sprawling game with 4,000 different locations, including the entire New York City subway system. The plot is a search for the hero's own identity.

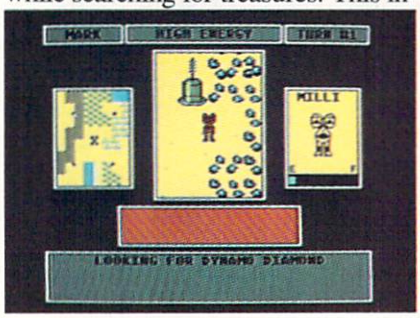
Portal (Activision) is finally nearing completion, according to the publisher. It is described as an icon-driven computer science fiction novel. Rob Swigart is the author.

The latest in the series of all-text computer novels which began with *Mindwheel* is *Breakers* (Broderbund-Synapse, $39.95). It's a complex science fiction story, and it is said to have a higher excitement level than a couple of the earlier titles.

Infocom's legion of devoted fans should be particularly pleased by the company's next trio of releases. The format remains the same, but the subject matter is more varied. *Trinity,* written by Brian Moriarty, is a time travel story. The adventurer must reshape history so an atom bomb does not destroy London.

Leather Goddesses of Phobos is a spicy satire of 1930s pulp science fiction by Steve Meretzky. The Leather Goddesses want to turn earth into a sexual playground, but you've got to stop them anyway. It's a sequel, of sorts, to *Starcross.*

Infocom hopes *Moonmist* will prove especially interesting to female players, because it has an ambience similar to the Nancy Drew books. The object is to find the castle ghost while searching for treasures. This introductory level game has four variations, each with different treasures, hiding places, and dangers.

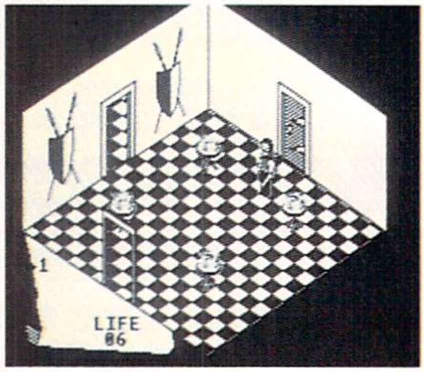


Scavenger Hunt ***includes cards, board.***
READER SERVICE NO. 272

The Pawn (Firebird) features the most flexible and responsive parser ever included in a home computer adventure game. The illustrations for this fantasy adventure are equally outstanding. The same design outfit, Magnetic Scrolls, will shortly introduce an even more ambitious sequel called *Guild of Thieves,* which will appear for the Commodore sometime in 1987.

Hacker II: The Doomsday Papers (Activision) is Steve Cartwright's sequel to last year's hit adventure strategy game. This time, the government needs your help to avert disaster. The player uses the robots to break into a computer complex and get the evidence to stop a sinister scheme.

Murder Party (Electronic Arts) brings 1986's hottest parlor game craze to the home computer screen. It furnishes everything needed to host a murder party for up to seven people. The package includes invitations, clues, and complete instructions. A big advantage over similar, non-electronic products: *Murder Party* has variable culprits and clues for each play-session.



Fairlight: ***3-D role-playing fantasy.***
READER SERVICE NO. 273

In *Gunslinger* (Intellicreations/Datasoft), a friend will hang in two days if you can't spring him from a Mexican jail. Meanwhile, the six Dalton brothers are out to get you in this wild west romp.

The NeverEnding Story (Intellicreations/Datasoft) is a kid-venture based on the movie and book of the same name. The goal is to save the land from the all-consuming Nothing and restore the empress with the aid of Falkor, the Luck Dragon.

Super Sports Simulations

Sports simulations are now second only to adventures in popularity among computer gamers. Both strategy and action are well-represented among titles which will reach store shelves by the holidays.

True Stat Baseball (SubLOGIC) is a statistical replay baseball game for one or two armchair managers. Among its unique features is a system of park effects. Balls which would be long outs in Dodger Stadium sail over the wall for home runs when you play in Yankee Stadium. Clever graphics even show the monuments located (until recently) out in centerfield in the House That Ruth Built.

Championship Baseball 1986 (Activision/Gamestar) is a revamped version of *Starleague Baseball.* The strong points of the original remain intact, but now there's a closeup view of the batter and pitcher on the right-hand side of the playscreen.

Fans of action-sports simulations should put *World Games* (Epyx) on their holiday "want" lists. In the great tradition of *Summer Games I and II* and *Winter Games,* up to eight computerists travel the globe and compete in eight exciting events.

MicroRing WWF Wrestling (Micro League Sports Association) is the working title of a statistically based wrestling simulation starring Hulk Hogan and a cast of colorful rulebreakers. One or two participants use the joystick to select holds from menus, which the program then depicts onscreen in full-color, digitized animated sequences.

Championship Wrestling (Epyx) is a joystick-activated mat game for one or two computerists. The grapplers, shown in modified overhead perspective, can apply approximately 20 holds from a clothesline to an atomic drop.

Don't laugh at the idea of a computer bowling title until you've rolled a few games of *10th Frame* (Access Software, $39.95). Up to eight keglers can enjoy this beautifully presented simulation. The gamer positions the onscreen bowler and determines the power of the swing.

Yie Ar Kung Fu (Intellicreations/Datasoft) is another entry in the martial arts sweepstakes. The onscreen fighter advances rank by rank from white belt to a final confrontation with a kung fu champion.

The first-person perspective in *Super Cycle* (Epyx) makes the player feel the full effect of the 180 mph scale speed as the bike banks into turns and sweeps past well-drawn roadside objects. The program contains progressively harder courses to test the driver's skill.

Games for Thinkers

The Movie Monster Game (Epyx) brings *Crush, Crumble & Chomp* up to date. The gamer can become God-

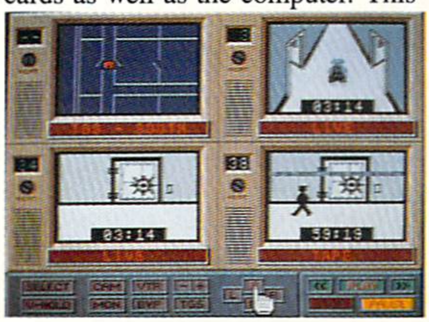


You too can be a silver screen star! **The Movie Monster Game** *allows you to devastate cities in the guise of Godzilla or one of five other gigantic scaly things.* *READER SERVICE NO. 274*

zilla, or one of five other monsters, and devastate one or more of the world's major cities. The three-quarter perspective graphics give the game a cinematic feel.

Crosscheck (Intellicreations/Datasoft) is a crossword/*Scrabble*-type territorial battle. An onscreen die roll tells a player how long a word to build. The first contestant to construct a chain of words from the center of the board to the home base is the winner.

Scavenger Hunt (Electronic Arts) utilizes a gameboard and a deck of cards as well as the computer. This



Hacker II: *sequel to last year's hit.* *READER SERVICE NO. 275*

family-oriented program by Ozark Softscape should be good at a party or family gathering.

221B Baker Street (Intellicreations/Datasoft) challenges the detection abilities of one to four sleuths with 30 cases set in Victorian London. This is the computer version of the already hugely popular boardgame. An extra disk with 30 new cases is already in preparation.

The popularity of games with a heavy strategic component has meant a corresponding drop in real-time action contests. Pure shoot-em-ups are going to be even more rare over the next six months, but the roster of forthcoming titles includes several disks which should please the joystick jockeys.

The airbrushlike graphics in *Starglider* (Firebird) gives this combat distinctive appearance. The player pilots the only surviving attack vehicle left on the planet after an invasion from outer space. Air-to-air and air-to-ground combat matches the computerist's craft against the Ergonians' enormous flagship, the Starglider.

Tracker (Firebird) is an action-strategy contest which puts the player in charge of the Tactical Remote Assault Corps. TRAC must penetrate the automatic defenses which ring a malfunctioning computer complex. The gamer can only actively control one of the eight attack robots at a time, so it takes some quick switches to prevent the defending Cycloid fighters from overwhelming a dormant one.

Mercenary: Escape from Targ (Intellicreations/Datasoft) is a cross between a flight simulator and an adventure. The protagonist has crash landed on a planet and can explore in the air, on the surface, and underground. Excitement awaits the onscreen hero everywhere.

Wars on the C-64

Some of the most intriguing game programs scheduled for release before New Year's march to a martial

cadence.

The player flies an Apache attack helicopter loaded with hellfire laser missiles, cannon, and rocket pods in *Gunship* (MicroProse, $34.95). Pilots seek out the enemy with laser range-finders. Day and night missions let the whirlybird face everything from guerillas to Soviet surface-to-air missiles.

The flip side of the situation depicted in *Silent Service* is the basis for *Destroyer Escort* (MicroProse). The mission is to protect unarmed flotillas of up to 39 ships as they ply the water routes between Britain and North America.

Battle of Britain/Battle for Midway (Firebird, $19.95) looks like an excellent value for armchair military strategists. One of the disk's two programs realistically simulates the titanic struggle between the RAF and the Luftwaffe, while the other makes the gamer the commander of the U.S. Pacific Fleet after Pearl Harbor.

Non-Game Entertainment

Don't wait until Christmas Day to give someone *Jingle Disk* (Hi Tech Expressions, $9.95). This cheery little item plays holiday songs and helps the computerist make personalized greeting cards.

PartyWare (Hi Tech Expressions, $14.95) is a two-disk product which composes banners, party hats, ribbons, place mats, place cards, invitations, notes, and greeting cards. It also has a party-planning checklist, game ideas, and a database which holds 60 names, addresses, birthdates, and so forth. The program can generate an animated message disk which the recipient can play on any Commodore 64. Hi Tech Expressions also offers *JollyWare*, special, festive printer paper.

Walt Disney Card & Party Shop (Bantam Electronic Publishing, $34.95) makes it easy to design stationery and greeting cards. More than 100 special graphics and 45 decorations add a special Disney touch. The art tool box allows the craftsperson to resize, transpose, and otherwise manipulate the images.

Certificate Maker (Springboard, $49.95) has a bank of 200 certificates which the user can customize and print. Border, message, and signature line are all modifiable.

Walt Disney Comic Strip Maker (Bantam Electronic Publishing, $34.95) allows young computerists to create three-panel strips which can be printed out in either color or black and white. The user selects characters, objects, backgrounds, and balloons from the disk's databanks, then puts dialogue in the word balloons.

Video Shop (Intellicreations/Datasoft), an easy-to-use tool for videophiles, provides a method for the speedy production of customized titles and introductions for homemade videotapes.

Toy Shop (Broderbund, $59.95) is a whole box of goodies on a mylar platter. It creates 20 working models and toys. Toys are customized on the screen, printed out, and attached to adhesive cardboard.

Final Thoughts

Of course, manufacturers' schedules aren't carved in stone. Development and production problems will delay a few disks.

By the same token, some unexpected releases are certain to jump into the spotlight. Competition-conscious publishers don't want to tip all their plans in advance.

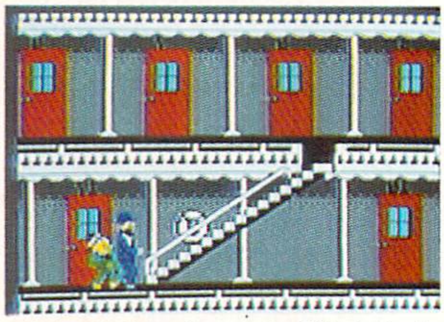
In fact, computer stores will have most of the titles discussed here by the time Santa Claus is ringing his bell on every street corner. It looks like the season to be jolly for those who love entertainment software. ☐

MURDER ON THE MISSISSIPPI
Activision
Commodore 64
Disk; $34.95

Mayhem and mystery are passengers on the Delta Princess as it rolls down Old Man River from St. Louis to New Orleans. Sir Charles Foxworth, the renowned British sleuth, is aboard the sternwheeler, along with his trusted gentleman's man, Regis Phelps. When murder most foul is discovered, it's up to the gamer, as Sir Charles, to locate the body, question the passengers and crew, gather clues, and solve the crime.

The setting of this delightful melodrama is so appealing that gamers might be tempted to forego the mystery, and just stroll the decks of the beautiful riverboat. The Delta Princess is a quadruple-deck palace, complete with cabins, wheelhouse, salon, and staterooms. The sound of the lapping waters is realistic, and the colorful flag waving in the breeze adds a lovely note to the scene.

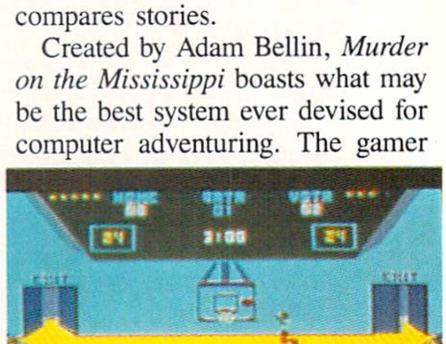
Sir Charles, accompanied by Regis, starts the game by wandering freely from deck to deck. But even as he meanders through the ship, poking around in unlocked rooms, someone is committing murder. Soon, if he looks carefully, the body turns up and the mystery really begins.



Solve the **Murder on the Mississippi.**
READER SERVICE NO. 276

The titled detective must talk with the eight suspects again and again as he cross-examines testimony and compares stories.

Created by Adam Bellin, *Murder on the Mississippi* boasts what may be the best system ever devised for computer adventuring. The gamer



GBA Championship Basketball: *¾ view.*
READER SERVICE NO. 277

employs the joystick to manipulate a series of onscreen menus. Available options permit investigation, questioning of suspects, and even automatic note-taking.

The sleuth uses joystick-selectable menus to talk to each suspect about him/herself, the victim, and other people on board. The gamer chooses a phrase like "Tell me about...", and then selects a picture of the character under investigation.

The answers become the basis of Sir Charles' notes, in one of the most unusual features of the game. The gamer points to words in the suspect's testimony with a hand-shaped cursor. Anything marked in this manner is entered on Charles' notepad. The detective can keep one line of information out of each statement and may accumulate up to three pages of notes about each person.

The notes are parts of a story which, once assembled, leads Sir Charles to the killer. If the computerist accuses an innocent, he may get Sir Charles tossed off the boat. And if the boat reaches New Orleans before the mystery is solved, the murderer gets away free.

The program provides the sleuth with quite a bit of assistance. Physical evidence is scattered around the boat, including a passkey to the locked rooms and oily rags used to clean a gun. Regis pockets the evidence on request, or it can be stored in Sir Charles' steamer trunk in his cabin. Some items must be searched very closely to extract the clues, so Charles has an examining table for eyeballing things in detail.

Charles also collects information by walking up to objects in each room and investigating them. However, it is sometimes difficult to get Charles next to the item the gamer wants to study, particularly if there are obstacles in the way.

The elegance of the setting makes the mystery more enjoyable. Every C-64 user should be thrilled by the handsome sternwheeler, the lovely staterooms and salons, and the cleverly drawn, cartoon-style characters who people the riverboat. The game is further enhanced by Ed Bogas' original music. The cheerful themes brighten Sir Charles' deck strolls, and enliven each new scene.

Murder on the Mississippi is pretty to look at, but far from simple to solve. This is one cruise you won't want to miss.

Activision, 2350 Bayshore Frontage Road, Mountain View, CA 94043 (phone: 415-960-0410).

—Joyce Worley

GBA CHAMPIONSHIP BASKETBALL (TWO-ON-TWO)

Gamestar
Commodore 64
Disk; $34.95

We moved across half-court, and I pulled back a second to steal a glimpse of the clock. Less than a minute left.

My presence immediately drew the attention of a Condor defender, while his partner covered my teammate, Magic Lyndon.

Abruptly, I broke for the net, rolling slightly to the right and inside the defender. At the top of the key I stopped, spun, and lofted the roundball in a smooth arc toward the hoop.

The shot hit the rim, but Magic, who was skywalking in the neighborhood, cleanly snatched the rebound. He swallowed up the ball and disappeared under the swarming Condor defenders.

An instant later, the ball came blasting out of the pileup and caught me in the hands—a picture perfect pass. The Condors instantly broke off mugging the Magic Man and made a beeline for yours truly.

As they reached me, I found Magic with a pinpoint pass. In the open now, he took two steps, then rattled the white string with a tomahawk jam.

The wonderful thing about the above description of action from *GBA Championship Basketball (Two-on-Two)* is that it contains no elaboration, embroidery, or poetic license. That is how the game actually *plays,* and this vignette hardly incorporates half the features of the program.

Like most Gamestar titles, *GBA Championship Basketball* offers arcade-style action with strategic overtones. Users "design" their player surrogates by assigning numerical values for each skill area. A total of eight points is divided between inside and outside shooting ability. Another eight are apportioned between dribbling and stealing, and a final eight between quickness and jumping.

In one-player games, or two-player, head-to-head contests, a draft is held and the user selects a champ to comprise the other half of his team. The 10 available players are described in the documentation, but each is clearly based on an actual NBA allstar ("Magic" Lyndon, Elgin Cutter, Kareem Ungrin, etc., with surnames taken from members of the Gamestar design group).

With two gamers, *Two-on-Two* is played either head-to-head or with both players on the same team against a computer-coached tandem. The latter is an especially refreshing experience since the players can call to one another and set up as they would on

an actual court.

Two-on-Two is a full-court basketball simulation with half the court onscreen at any given time. Once possession changes, the computer controls the offense as it moves to midcourt. This period is allotted to play-calling, as the computerists move joysticks to select one of four offensive/defensive setups. Once the ball passes mid-court, control returns to the player on offense.

The simulation also includes fouls, traveling, and three-second violations. Once a team draws five fouls, it's free throw time. The clock is set at 24 seconds, and play elements include stealing, shot blocking, timeouts, and, of course, rebounding.

GBA Championship Basketball (Two-on-Two) features excellent graphics which display the court at a three-quarters perspective, as viewed from above center-court.

The game has only one serious flaw–the clock isn't visible during the pause or time out mode. As a result, the only way to check the time is to look from the action on the court up to the clock and back again. In an actual game, players can at least see the clock during time outs!

No review of a game subtitled *Two-on-Two* would be complete without a reference to the all-time computer hoop classic, Electronic Arts' *One-on-One*. Unlike that program, *Two-on-Two* does not let users control computerized simulacra of real NBA superstars–those players are strictly computer-guided in *Two-on-Two.* Instead, its strength lies in the level of strategy two-man teams create.

Games are part of a League context. The user contests in any of four five-team divisions. After each game, the results and subsequent standings are presented in a "sports page" format.

There's a "practice" mode and a regular game format, but period length is not programmable. Difficulty is determined by the division in which you play.

Documentation is first-rate, with complete team and player ratings, shooting percentages, and tactical tips.

Sports and action game fans will absolutely love *GBA Championship Basketball*, the first C-64 roundball simulation to go beyond the schoolyard and explore the possibilities of team play.

Gamestar/Activision, 2350 Bayshore Frontage Rd., Mountain View, CA 94043 (phone: 415-960-0410).

–Bill Kunkel

EUROPE ABLAZE

Strategic Studies Group
Commodore 64
Disk; $50.00

If it is possible for a military simulation to be too good, too detailed, too versatile–then *Europe Ablaze* probably approaches that plateau. But for those who constantly reach for new levels of complexity and strategy, for those who want to expand and enrich their wargaming, *Europe Ablaze* is a must.

Briefly, *Europe Ablaze* recreates the air war over Europe over a five-year span. It also goes beyond the stage of "Which side you wanna be, good guys or bad guys?" A player may fill any of 12 different jobs. Each side has a Commander-in-Chief, supported by five lesser commands.

The computer handles all the jobs not taken by a human. In consequence, two players can work in tandem against the computer, as well as compete against each other head to head.

One side is the Germans, trying to bomb England into submission. The other side is the American and British forces, trying to stave off the attack and launch a counteroffensive.

The game includes three different scenarios. "Their Finest Hour," Aug. 10-Sept. 4, 1940, commonly known as The Battle of Britain, is the basis of the first. The second is "Enemy Coast Ahead," July 23-Aug. 20, 1943, which involves raids by the Allies against Germany. The third is "Piercing The Reich," Feb. 3-26, 1944, where it was the Allies' turn to try to bomb Germany into surrender.

It's impossible to find serious flaws. The most this reviewer can offer is a caution: a simulation of such scope can't help but overwhelm a novice gamer or one with limited knowledge and/or experience with air battle titles.

To SSG's credit, *Europe Ablaze* comes packaged with extensive playing aids and a friendly rulebook. It's only 20 pages, mostly due to the program's easy-to-use menu-driven structure. The authors wanted the novice to be able to play at first attempt. Winning is another matter.

The instruction book includes tutorials for both the positions of C in C and Air Fleet Commander. It takes the computerist through a sample game, prompting the right menu choice to make at each step.

As C in C, the gamer decides what priority to assign to each command, then allocates missions and assigns an activity level. At the Air Fleet Commander's post, the commander must dispatch individual planes to the tasks created by Allied action.

All orders are entered through the keyboard. Most of the pertinent information is at the player's fingertips. The trick is more in knowing what data to request and at what time. Conditions for victory determination

differ for each side. The force with the highest point total of the C in Cs wins that scenario, and the Air Fleet Commander with the highest total is the overall winner.

The gaming aids are a colorful laminated sheet with all the game menus and two full-color maps. One shows the coast of Germany and the British Isles for Scenario One. The second map depicts Germany with part of Britain for Scenarios Two and Three.

The most exciting feature of *Europe Ablaze* is the Game Design Kit. It allows users to create their own scenarios and play a fourth scenario described in the rulebook, which is set in the Mediterranean Theater in March of 1944.

The kit includes a 42 × 36 hex grid, 24 aircraft types, 255 squadrons, 127 airbases, 63 city centers (with population, industry, communications, and ports), 63 radar stations, 63 shipping lanes, 63 flak units, identity and briefing routines, cursor selection, national doctrine, weather creation, and victory determination. If this game doesn't become one of the most often booted in your software library, you're not a true wargamer.

The 24-page Design Manual is a step-by-step guide to scenario creation. Not originally meant to be included with the game, the design kit was only created to make it easier for the game's designers to communicate with each other. But it certainly adds value to a steeply priced title.

Europe Ablaze will provide endless hours of enjoyment for dedicated wargamers. It stands as the best computer military simulation published so far in terms of historical accuracy and playability.

Electronic Arts, 1820 Gateway Drive, San Mateo, CA 94404 (phone: 415-571-7171). *—Rick Teverbaugh*

WORLD KARATE CHAMPIONSHIP
Epyx
Commodore 64
Disk; $25-$35

World Karate Championship is yet another home variant of Data East's coin-op arcade hit, *Karate Champ.* This version is notable for crisp programming, excellent animation, and an atmospheric soundtrack.



World Karate Championship: *a kick.*
READER SERVICE NO. 278

Like other contests based on that classic, *World Karate Championship* displays two combatants in side perspective while an onscreen karate master rates knockdowns and declares the winner of each round.

The fighters are controlled by joystick, and perform 11 different maneuvers from either direction. Fighters block kicks and punches automatically when moved backwards. Combatants leap, throw leg sweeps, deliver three kinds of punches and five types of kicks, and can somersault forwards or backwards.

In between rounds, special tests are staged in order to advance to the next level. These challenges include breaking a stack of ten boards with your head and avoiding a fusillade of spears and knives.

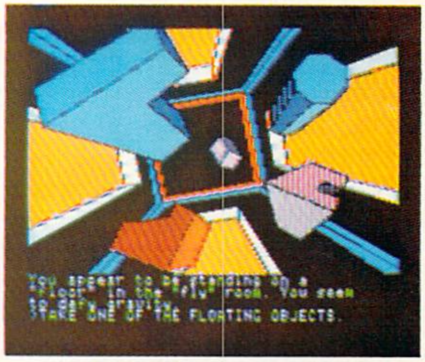
The sounds, musical background, and visuals on *World Karate Championship* are striking. Before each game, the user opts to begin the contest in Egypt or Australia. Each subsequent round moves to a new locale, from New York City to Mt. Fuji. These beautifully painted settings provide *World Karate Championship* with invigorating backdrops.

The musical score is appropriately Eastern, with the subtly dissonant yet haunting twang of Oriental music accompanying the smacks, thumps, and kicks of martial combat.

Documentation is excellent, but it will still take most users several hours of play to develop true mastery over the extensive repertoire of moves.

World Karate Championship may not win any awards for innovation, but in terms of delivering a quality product, this Epyx program gets a black belt.

Epyx, 1043 Kiel Court, Sunnyvale, CA 94089 (phone: 408-745-0700).
—Bill Kunkel



Oo-Topos: *interactive sci-fi novel.*
READER SERVICE NO. 279

OO-TOPOS
Polarware/Penguin Software
Commodore 64
Disk; $17.95

Michael Berlyn's *Oo-Topos* was first published by Sentient Software for the Apple II+ back in 1981. It was one of the earliest attempts to produce an interactive science fiction novel on computer. Berlyn, a genuine SF author ("Crystal Phoenix," "The Integrated Man"), proved the ideal man for the job, and *Oo-Topos* became a cult classic.

Now Michael and his wife Muffy have updated their classic adventure to interface with the Polarware's "Comprehend" graphic novel format. Raimund Redlich and Brian Poff added some fantastic illustrations, and the whole process breathed new life into an old favorite.

The gamer guides an Astro Mega Class, Tachyon Drive Spacecraft on a vital mission (delivering a compound to neutralize the deadly "power transfusion waste" threatening the earth). The drama heightens when a tractor beam grabs and forces the craft down on the hostile world Oo-Topos. On the surface, nasty locals overpower and imprison the pilot on board.

The adventurer must escape the cabin, regain control of the ship, and complete the mission.

The graphics are excellent, possessing a comic book vitality which is especially effective in the rendering of high-tech machinery. As much of the game is set on board a spacecraft, this is quite relevant.

Oo-Topos works very well with the Comprehend system. The action moves smoothly, there are few dead spots, and the player experiences a minimum of frustration at being unable to interface with the program. The only flaw is the parser's inability to handle uppercase letters. It is also disarming that graphic changes are done with a great flash, during which the entire screen goes black.

The documentation is extensive and well-presented. While there's plenty of extras to add context (including a letter from the President, a list of mission codes, and the operator manual for your ship), there's also a detailed explanation of the nuts-and-bolts—how to load, tips for communicating via Comprehend, and a lecture on the importance of mapping.

It's hard to know if there are many older games which could stand up under this type of modernization, but *Oo-Topos* comes through with flying colors. It's a pleasure to see its gripping story dressed up in the latest style adventure game system.

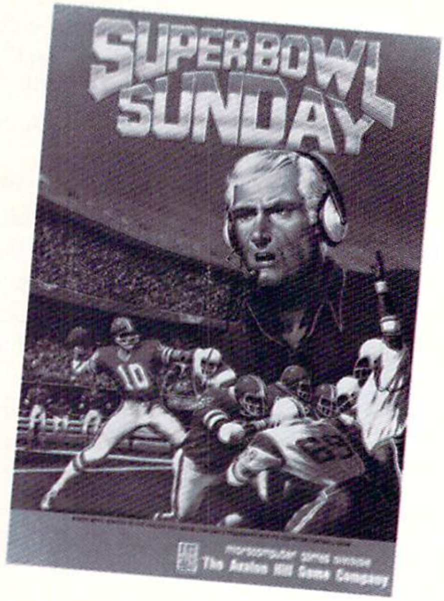
Polarware/Penguin, 830 Fourth Ave., Geneva, IL 60134 (phone: 312-232-1984). *—Bill Kunkel*

SUPER BOWL SUNDAY EXPANSION DISK #2

Avalon Hill
Commodore 64
Disk; $20.00

Graphics, breadth of play-calling options, and statistical accuracy make *Super Bowl Sunday* the outstanding statistical replay football program in the home computer field. Its legion of fans have clamored for additional teams since the title first appeared in 1985.

The Avalon Hill Game Company is now addressing this market for supplementary disks. The company, which previously published a disk based on the complete 1984-1985 National Football League season, now offers a collection of 12 more outstanding pigskin matchups, some of which occurred prior to the dawn of the Super Bowl era. Naturally, the 24 teams can be matched against each other in any desired combination, or pitted against squads contained on other *Super Bowl Sunday* disks.



Disk #2 offers 12 high-powered teams.
READER SERVICE NO. 108

Matchups included on the disk are Detroit-Cleveland, 1953; Baltimore-New York, 1958; Buffalo-Cleveland, 1964; Green Bay-Oakland, 1967; Kansas City-Minnesota, 1969; Dallas-Miami, 1971; Miami-Washington, 1972; Pittsburgh-Minnesota, 1974; Pittsburgh-Dallas, 1975; Oakland-Minnesota, 1976; and Dallas-Denver, 1977. The simulation of the older teams isn't perfect, primarily because football itself has mutated during the intervening years, but all these high-powered clubs are fun to coach and offer a pleasing variety of offensive and defensive weapons.

Pigskin partisans can only hope that the next expansion module will be a disk which facilitates player swaps among teams. Just think of the fun of fielding a squad with Joe Montana handing off to Jim Brown and Frank Gifford!

Avalon Hill, 4517 Harford Rd., Baltimore, MD 21214 (phone: 301-254-9200). *—Arnie Katz*

Reviewed next month:

- Spitfire 40
- Psi 5 Trading Co.
- Super Cycle
- Frankie Goes to Hollywood

128 TO 64 AUTOBOOT

By Daryl Marietta Jr.

From time to time, you Commodore 128 owners have probably needed to run a C-64 program or two. However, upon turning on the machine, you may at times have forgotten to hold down the COMMODORE key to go into 64 mode, and had to either switch it manually or reset the computer and start over. Or there may have been other times when you wished you could have the machine autoboot a 64 program when turned on by a timer. Now these problems can be solved by installing the *128 to 64 Autoboot* routines on your disks.

Most 128 users already know that the machine can autoload and run a 128 program in 128 mode. The only problem is keeping a program running after switching modes. This is accomplished by setting a few key bytes to certain values in order to trick the 64 mode into thinking that a cartridge is plugged in.

The 128, upon power-up or resetting, checks for an autoboot by reading the disk at track 1, sector 0. It then prints the boot message found on the disk and loads a binary file into memory. This contains the code to make the 64 mode autoboot. The 128 then jumps into 64 mode, initializes for 64 mode, and loads the first program on the disk. Control is then passed back to the BASIC interpreter. If the first file on the disk is a 64 autorun program (which is the first file on many 64 owners' disks), the 64 continues to load its program as if you had typed LOAD":*",8,1 (RETURN).

To use the *128 to 64 Autoboot*, enter the 128-64.BAS listing on page 119. When you run this it creates the disk file 128-64.BIN. This is the only file you have to put on the autoboot disk. You can then set the 128's autoboot sector with the 1-0.BAS listing on page 120. The program asks for the boot message, which can contain control characters, and you terminate the input by using the back arrow key.

The *128 to 64 Autoboot* also works on commercial software, as long as the program does not use the 128 boot sector and allows you to put an extra file on the disk. ☐

SEE PROGRAM LISTINGS ON PAGE 119


COMMODORE
MONITORS
RETAIL $299
$99
FULL COLOR
FREE TRIAL PERIOD
RETAIL $400
$259
RGB
PRINTERS
$69
COMMODORE
NEAR LETTER QUALITY
$149
FREE TRIAL PERIOD
EPSON
HOMEWRITER 10
DISK DRIVES
1541
$149
1571
$238
MODEMS
300 BAUD
$28
1200 BAUD
$88
64 POWER SUPPLY
COMMODORE
$39.00
On Sale!
RADAR DETECTOR
High Performance
NOW
RETAIL $249.00
$88.00
THE EASY BEEP
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QUICK CHANGE

For the C-64

By Buck Childress

After slaving over the computer for a seeming eternity to complete your latest program, you've discovered that several dozen lines need to be changed. Gremlins must be crawling around inside your 64, because at every opportunity *it* managed to type PIRNT instead of PRINT. And, to top it off, you're beginning to notice that your lines of data have the number 86 all over the place. You know it was supposed to be 96. Those darn gremlins. Now you'll have to spend another eternity finding and changing all of *their* mistakes. Well, it could be worse. At least you don't have a splitting headache–yet. But, somehow, you know one is on the horizon. Wouldn't it be nice if you could just take two aspirins and call the computer in the morning? Better yet, how about telling ol' Reliable what to change and letting *it* do the work?

Quick Change automatically changes anything you want, from numbers and strings to command words and graphics. Virtually anything in your BASIC program can be changed quickly and easily with *Quick Change*. Just tell *Quick Change* what to change, give the range of lines, and presto...the swap is made. You can use *Quick Change* to erase unwanted items as well.

After saving a copy of *Quick Change,* run it. The loader POKEs the machine language data into memory and checks for errors. If none are found, it's ready to use. Now load the program you want to change.

Quick Change can be switched on and off by typing SYS 50000 and pressing RETURN. The first SYS switches it on, the second switches it off, etc. A message will let you know whether it's on or off. It's a good idea to leave *Quick Change* off while you load, save, or run a program.

When you're ready to start making changes, switch *Quick Change* on. To use *Quick Change*, press any letter key (A-Z), then RETURN. (This is faster and easier than having to type a SYS number every time you want to change something.)

Quick Change asks for the old entry. You can enter up to 26 characters. They can be anything, including cursor control keys, function keys, and keyboard graphics. After you've answered and pressed RETURN, you'll be asked for the new entry. It, too, can be anything, up to 26 characters long. If you're using *Quick Change* to erase the old entry, don't give a new entry. Just press the RETURN key. "ERASE" will appear, verifying this choice.

Next you'll be asked to enter the range of lines you want the change to occur in. This is done in the same manner as when you LIST a program. For example, if you want the changes to take place through line 200, you would enter

```
-200
```

Changes from 100 to 350 would be entered

```
100-350
```

and changes from 500 to the end of your program would be like so:

```
500-
```

If for some reason you only want to change one line, say, 400, enter it like this:

```
400-400
```

Should you want the change to take place throughout the entire program, just press RETURN without entering anything.

If you make a mistake while answering a prompt, press the DELETE key. Pressing it again will take you to the previous prompt.

Quick Change is in the NORMAL mode when you first enter it. In this mode it only changes (or erases) entries that are not part of DATA or REM statements or contained in quotes. As an example, if you were changing PRINT to INPUT, it would be changed from this:

```
100 PRINT "PLEASE PRINT YOUR NAME"
```

to this:

```
100 INPUT "PLEASE PRINT YOUR NAME"
```

Pressing the CONTROL and N keys at the same time will return you to the NORMAL mode if you inadvertently switch to another.

If you want to change entries contained in quotes–including cursor control keys, function keys, and keyboard graphics–press the CONTROL and Q keys. Only items within quotation marks will be changed. Our example would be changed from this:

```
100 PRINT "PLEASE PRINT YOUR NAME"
```

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to this:

```
100 PRINT "PLEASE INPUT YOUR NAME"
```

CONTROL and D enters the DATA mode. Now only DATA items can be changed. So, if you wanted to change data number 123 to 169,

```
200 DATA 123
```

would now be

```
200 DATA 169
```

Lines such as

```
150 PRINT 123
```

would remain unchanged.

The same is true for string data. If you ask *Quick Change* to change ABC to CBA,

```
210 DATA ABC
```

becomes

```
210 DATA CBA
```

Lines like

```
160 PRINT ABC
```

remain unscathed.

The REM mode works like the DATA mode. The difference is that only REM items can be changed. CONTROL and R brings you here.

The ALL mode is just what its name implies. It changes all occurrences of the chosen victim. CONTROL and A does the job. In the ALL mode a command to change PRINT to INPUT will change it everywhere. These lines:

```
100 PRINT "PLEASE PRINT YOUR NAME"
110 DATA PLEASE,PRINT,YOUR,NAME
120 REM "PLEASE PRINT YOUR NAME"
```

will be changed to

```
100 INPUT "PLEASE INPUT YOUR NAME"
110 DATA PLEASE,INPUT,YOUR,NAME
120 REM "PLEASE INPUT YOUR NAME"
```

Erasing is done exactly like changing. Choose the appropriate mode and whoosh...the unwanted item is zapped from the program. Suppose you wanted to eliminate "YOUR NAME" (not yours personally) from the above example. Choose the QUOTE mode and answer the OLD ENTRY? prompt with YOUR NAME, then press RETURN. Without answering the NEW ENTRY? prompt, press RETURN again, and

```
100 PRINT "PLEASE PRINT YOUR NAME"
```

becomes

```
100 PRINT "PLEASE PRINT"
```

The mode you're currently in appears at the top of your screen. You can switch modes while you are answering the prompts. The various modes and their appropriate keys are listed on the screen.

Whether you're changing or erasing, remember to be accurate about defining the item. Suppose you want to change the data numbers 129 to 169. If you answer the OLD ENTRY? prompt with 2, and the NEW ENTRY? prompt with 6, every 2 in the data range you specified will be changed to a 6, whether it's 2, 22, or 92. This can easily be avoided by answering the OLD ENTRY? prompt with 129, and the NEW ENTRY? prompt with 169. As another example, if you answer the OLD ENTRY? prompt with REM and the NEW ENTRY? prompt with DATA, the following will result:

```
100 PRINT "REMEMBER TO CHANGE THE REM LI
NES"
```

will be changed to

```
100 PRINT "DATAEMBER TO CHANGE THE DATA
LINES"
```

Be specific. Answer the OLD ENTRY? prompt with THE REM or REM LINES and the NEW ENTRY? prompt with THE DATA or DATA LINES. You'll get the desired result:

```
100 PRINT "REMEMBER TO CHANGE THE DATA L
INES"
```

This becomes second nature with very little practice.

After you've answered the prompts, the screen clears and *Quick Change* displays all your answers in quotes so you can see exactly what it will be looking for, including spacing, etc. *Quick Change* also displays what it intends to do, along with the message "ARE YOU SURE? (Y/N)". Press Y for yes, or N if you're having second thoughts.

When changing a line, *Quick Change* doesn't allow excessive length. For example, if you decide to change REM to PRINT and, as a result, one of the lines will exceed 80 characters, *Quick Change* stops and displays the excessively long line. It also lists the line as it currently appears in the program so that you can make whatever corrections you might want.

Quick Change can be brought to a halt at any time by pressing the STOP key. To reuse *Quick Change*, press any letter key (A-Z), then RETURN.

Experiment with *Quick Change*. It's simple to use and zaps those gremlins fast. □

SEE PROGRAM LISTING ON PAGE 113

DVORAK KEYBOARD

For the C-64 and C-128



By Jim Partin

If you'd like to switch your C-64's or C-128's keyboard from the standard QWERTY to the more efficient Dvorak layout, endure the old method long enough to enter *Dvorak Keyboard.* The programs use a software method to activate the Dvorak keyboard; no hardware change is necessary.

Versions are included for the C-128 (in 128 mode) and the C-64 (or 128 in 64 mode). The programs don't use machine language wedges to implement the Dvorak layout, but modify the Kernal keyboard decode tables. Because of this, the new layout will work with a large number of programs provided the programs don't A) use the RAM that holds the new Dvorak layout or B) alter the memory locations that allow the alternate keyboard layouts to exist. While most public domain or magazine published programs will work, many commercial programs will not work. Cartridges such as the Epyx *Fast Load* may also have to be disabled to work with the new layout. Refer to the illustration for the new Dvorak keyboard layout implemented by the programs. Also, be sure to save the version of the program you type, as both program versions erase themselves after activating the new Dvorak layout.

Some final safety notes are necessary before using the programs. Keep in mind that while the RUN STOP/RESTORE combination will reset the C-64 to its normal keyboard layout, the same isn't true for the C-128. If you activate the Dvorak keyboard mode on the 128 and wish to return to QWERTY mode, just hold down the RUN STOP key and hit the side reset button. When you are dumped into the monitor, hit 'X' and RETURN. If you do accidentally hit RUN STOP/RESTORE on the 64 and want to return to Dvorak mode without rerunning the program, you can simply type POKE1,53 and press <RETURN>.

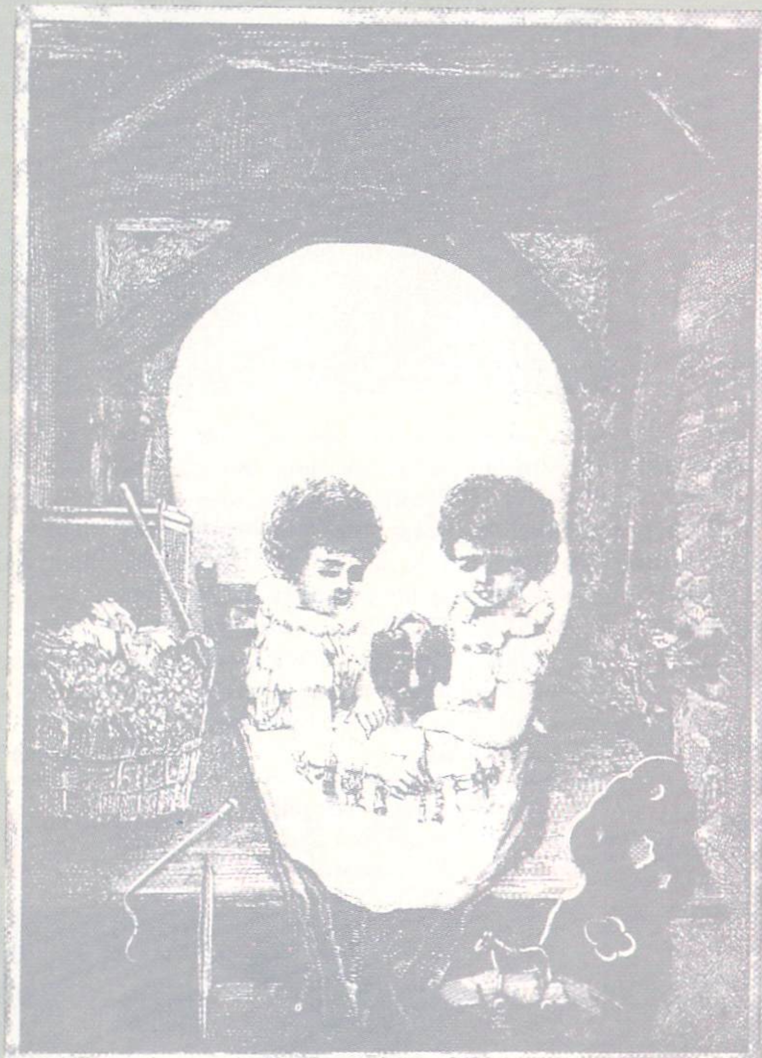
With some imagination, you can figure out a way to make Dvorak keycaps for your C-64 keys. Brown masking tape is best, since it will lift off without a fight if you elect to revert to QWERT.

The Dvorak layout is becoming more popular all the time. I hope these programs will help you get a taste of the future of computer keyboards. □

SEE PROGRAM LISTINGS ON PAGE 127

VAULT OF TERROR

Sarnoth was once a happy, prosperous land, a country of mirth and joy where the sun shone year-round. When the new king inherited the throne, he hoped his rule would be as easy and peaceful as his father's reign before him. In the two hundredth year since the fall of Lemuria, the bad omens began. Dogs began speaking in tongues right in the royal court. The full moon seemed to burn ashen red for weeks. Babies slept fitfully, and the kingdom was plagued by oversized serpents which surfaced from out of nowhere and made off with whole cattle.



BY CLEVELAND M. BLAKEMORE

One day, while the king was arguing with his counselors in court over the source of the blight that was upon the land, there arose a massive black cloudfront that moved over the kingdom and seemed to fix itself over the castle. The people trembled with terror and many locked themselves inside their houses.

In the midst of the shifting darkness over the Castle Sarnoth, slithering shapes moved up the royal road, over the moat and into the castle. Guards rushed into the courtyard to battle with the shadowy figures, seeking to protect the king, and their screams were the only indicator that they survived for even a moment. As the sun was eclipsed, there appeared four sets of glowing eyes in the darkness before the king. The counselors fell to their knees with horror, and the court jester began cackling madly.

The largest form moved closer. "We are the Naga'an ancient race of serpents from a land you have never seen. We seek a place of refuge here in Sarnoth. I claim your crown and your castle, in return for your life."

The king was the only one who survived the massacre that followed. He was found the next morning, ragged and filthy, wandering the countryside. The castle is devoid of human life, and there are none brave enough to venture within and see just what form of creature lives there.

The purpose of your quest, adventurer, is to journey into the dungeons beneath the castle, destroy the Naga, and return the crown and kingdom of Sarnoth to their proper owner. You will need courage, luck, and wit to succeed in the *Vault of Terror.*

This game is the result of an argument I had with a teacher at the college where I study in Texas. He thought my concept of a fast, three dimensional graphic game utilizing multiple sprites, page flipping, and sprite priorities, written in less than 20k of BASIC, was utterly out of the question, not without most of it using system jumps to machine language routines.

Well, here it is. I think you will agree that it is superior to most commercial games of this type, both in speed and quality. My one regret is that I could not throw in more monsters, but the program is a typing chore as it stands. I think you can type it in over two or three sittings, however—and you will find it well worth your time.

Gameplay is relatively simple and self-explanatory. You need a high quality joystick plugged into Port 1. Remove any utilities which might interfere with program memory above 49152, as this program uses the fourth block of video RAM almost exclusively. (I found that the game does not work with *Mach 5* from Access.)

When you run the program the first time, the screen will be dark until the character set is redefined. There will be a short pause (10 seconds) as the game is initial-

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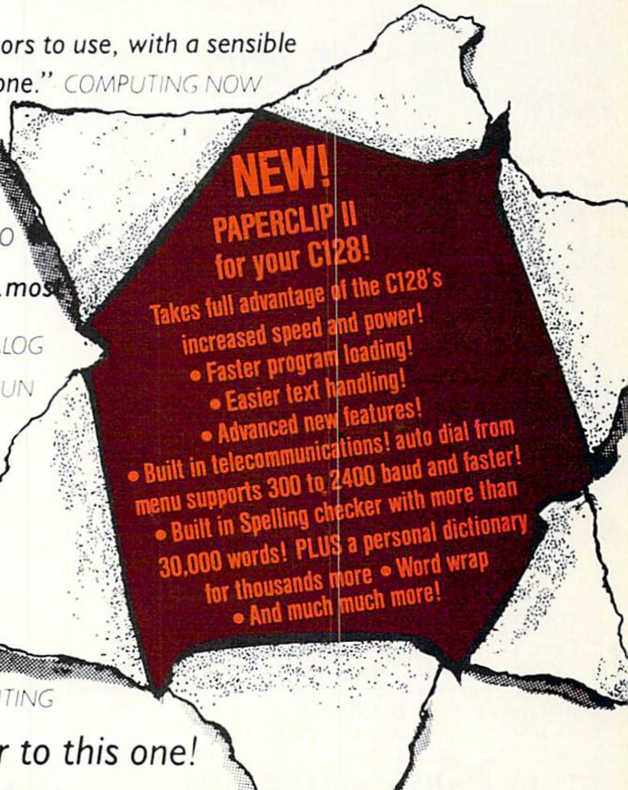
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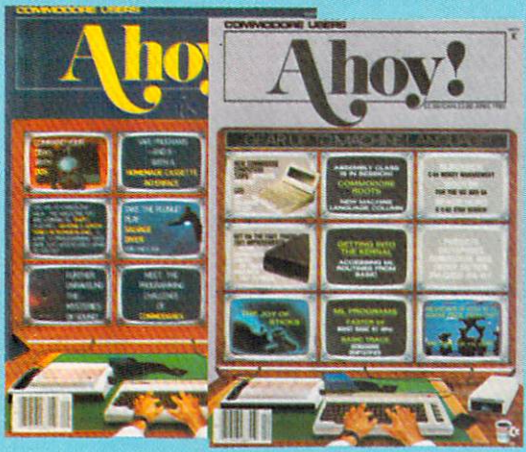
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ized, sprite data loaded, character data relocated, etc. The eight treasures in the game will appear on the screen. Remember what they look like. When the green bar appears at the bottom, with a choice of pressing f1 or f2, hit f1, since you do not have a game saved on disk yet. The title screen will disappear and you will find yourself in utter darkness, with only a red bar at the bottom of the screen, with several funny little symbols on it. The two letters on either side of the bar are your direction indicators—they show you which direction you are currently facing (N,S,E,W). Your only possession is a wooden torch. To use it, press the joystick button with the stick centered. The screen should light up, and you will find yourself looking down a long corridor, with a few turns and perhaps a coffin or a pit, with the shaft you came down above your head. To move forward, push the joystick forward. The bar at the bottom will flash the same color as the corridor, and the view will change, showing you one block forward of where you started. To turn left, push the joystick left. To turn right, push the joystick right. To go back, pull the joystick back. Whenever you move, the bar at the bottom will flash for a moment, and the new view will appear. If you have turned left or right, your direction indicators will show you your new compass bearing. Whenever you try to move through a wall, or try to enter a door backwards, there will be a little beeping sound to tell you that you can't move that way. As you wander through the vault, creepy music will play continuously in the background.

The bar at the bottom is the command bar. It has on it everything you can carry in this game. You can only carry one object of each kind. To see what you are currently carrying, simultaneously push the button and pull the joystick backwards. There will be a pause, and you should see a flashing cursor on the first object. Now simultaneously release the button and return the joystick to the center position. The cursor should remain flashing. The cursor is controlled by moving the joystick to the right (and only to the right) and releasing it when the white cursor is on the object you wish to manipulate. The bar reveals which objects you own by illuminating them in light red. You do not possess those in dark red. The object you are currently using is in yellow. If you want to pick UP an object, push the joystick up. If you want to put DOWN an object, pull the joystick down. If you possess an object (light red) and want to HOLD that object, move the cursor to it and push the button. There will always be a beep. The object will light up in yellow if you possess it, and you will be holding it. If you do not possess it, it will stay in white, and you will be holding either the torch or the last object you had. Either way, pushing the button leaves the command bar, and puts you back in control of movement. Now any time you push the button, you will USE the object you are holding (yellow).

The objects are, from left to right, torch, sword, shield, ring, rope, wand, key, gold, and the crown. Each object can be held, but using some objects, like the gold, will not have any effect. Some objects aid you just by possessing them, like the shield or the torch (which continues illuminating your way whether you hold it or not.)

You must be standing in a block to view the contents of the block. They will appear in front of you, on the floor.

Other objects have very special uses indeed, like the wand or the ring, and only display their properties when used. Basically, the purposes are as follows:

Torch: lights way, serves as makeshift weapon in absence of sword.

Sword: main weapon against monsters.

Shield: main protection. Absorbs 75% of blows.

Ring: much like that of Bilbo Baggins in *The Hobbit.* Read the book if you are not familiar with it. Without giving everything away, the ring gives you invisibility with a catch. The ring fools all the monsters except the non-organic ones. The only drawback is that your perception is weirdly altered when wearing the ring, and the dungeon appears distorted and unreal. You must take off the ring to attack anything. When you use the command bar, the ring will automatically be taken off.

Rope: used to climb down a shaft, or to indicate you want to go up if there is a LADDER and a CEILING EXIT in your block. You cannot go up without a ladder!

Continued on page 99

21 SECOND BACKUP (Version 4.1)
VG Data Shack
Commodore 64 with 1541 Disk Drive
Disk and hardware; $39.99

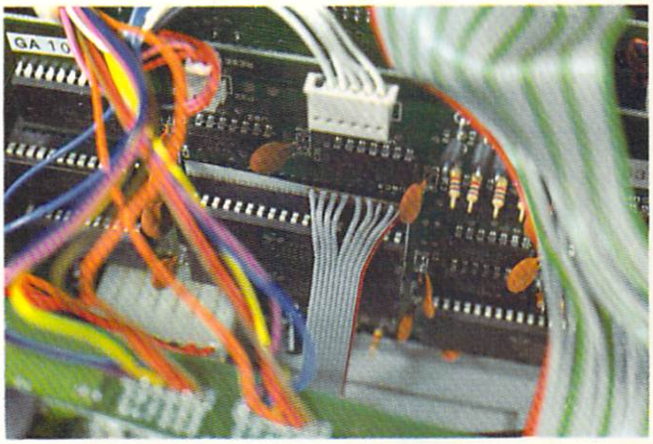
The magnetically encoded word is a fragile thing. The loss of a single bit from among the more than a million stored on the disk surface can render a program completely useless. Thus the need to back up all magnetic disks is a time-consuming but necessary evil which we will have to live with.

The 1541 disk drive is a sophisticated device with a built-in DOS and features that are not found on any other computer's disk drives. Unfortunately, when coupled with a C-64 computer, the 1541 is also one of the slowest disk drives ever made. The time needed to copy a single disk, using only Commodore's official DOS commands, is on the order of 40 minutes. This has resulted in a large number of software-based copy programs which work around the DOS's built-in limitations.

The *21 Second Backup* from VG Data Shack is a combination of hardware and software intended to assist in the duplication of Commodore 1541 formatted disks in the least possible time. It is designed for use with a Commodore 64 and one or two 1541 disk drives, or an SX-64 with its internal drive and an optional external drive. The result is the fastest 1541 disk duplication system available today. We clocked an SX-64 with an external drive at a mere 18 seconds for an unverified full disk copy!

How Fast Is Fast?

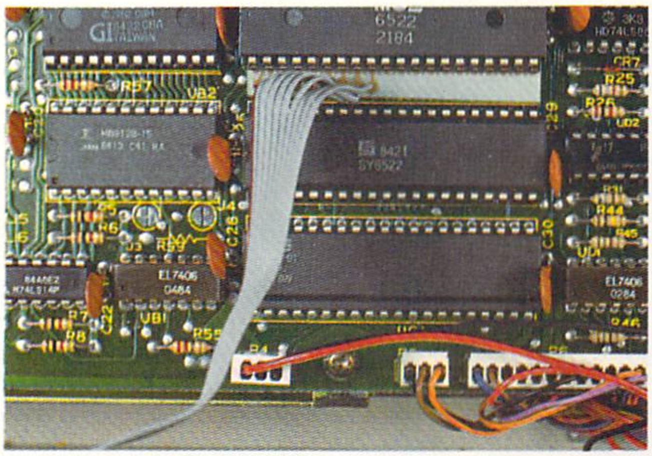
A normally formatted 1541 disk contains 35 tracks with varying amounts of data on each track. Once in the drive, the disk spins at a constant rate of 300 revolutions per minute. A simple calculation tells us that a complete data track will pass under the read/write head in just 2/10 of a second. Multiply this by 35 and double the result to permit writing it out, and we find that it should be possible to copy an entire disk in just 14 seconds.



Installation of 21 Second Backup *in an SX-64. Access to the VIA chip is more difficult than on the 1541 (below). READER SERVICE NO. 280*

In the real world things are not that simple. Some time has to be allocated for the physical movement of the read/write head. In addition, numerous calculations have to be performed on the data to convert it from the eight bit codes in the computer into the 10 bit GCR codes used by the drives. However, even when all these things are taken into account, we are still a long way from the aforementioned 40 minutes. All this really makes the 18 seconds we mentioned above a real accomplishment.

A large part of the data transfer delay is associated with the fiendishly slow serial bus as implemented on the C-64. Maximum transmission speeds on this channel, without special software enhancements, are less than 700 characters per second. *21 Second Backup* sidesteps this limitation by providing its own communication path.



Installation in the 1541 requires opening up the drive and prying out a 40 pin chip. The connection does not interfere with any disk drive operations.

What It's Made Of

The key to the performance of *21 Second Backup* is a simple piece of hardware whose major components are two 6' lengths of nine conductor ribbon cable. This pair of cables are equipped with three terminations. Two of these are low profile, 40 pin dual in-line integrated circuit sockets (40 pin DIP sockets to those who know about these things). Each DIP socket is mounted on a paper thin printed circuit board upon which the nine conductors terminate. The third terminal consists of a 24 pin printed circuit edge card connector which mates to the user port on the C-64.

The secret of *21 Second Backup* lies inside each and every 1541 disk drive. Among other things, every

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THE COMMODORE MAGAZINE THAT OFFERS YOU MORE

1541 is equipped with a pair of 6522 Versatile Interface Adapter large scale integrated circuits (VIA chips). The VIA is a specialized chip designed to handle serial and parallel communications among the various components of a microcomputer. Each VIA has two complete bidirectional eight-bit data ports. Of these four eight-bit ports, the 1541 only utilizes three. In fact, the fourth port is not even connected to anything inside the disk drive.

If you haven't guessed it by now, the 40 pin DIP sockets on *21 Second Backup's* cables hook up to the unused port inside the 1541. To accomplish this you will have to open up your disk drive and pry out the appropriate VIA chip from its socket (remember there are two VIAs in every drive). The 40 pin DIP socket is then pushed into the one on the 1541's circuit board and the VIA chip is reinstalled into the 40 pin DIP socket. The installation actually extends the 1541's VIA socket while permitting access to the unused parallel port.

The computer end of the cable goes directly to the C-64's user port. This port is internally connected to a 6526 Complex Interface Adapter (CIA chip) which is actually a big brother to the 6522 VIAs in the disk drive. If you have been following along until this point you will not be surprised to learn that the C-64's user port sports an eight-bit bidirectional data port originating from the built-in CIA.

The result is a fully wired eight-bit parallel bidirectional channel between the C-64 and one or two 1541 disk drives. In fact, since the VIA and CIA are tied directly to the microprocessor's data bus, this channel is as fast as the 6502 in the 1541 and the 6510 in the C-64 can be programmed to read and write data. This is very fast indeed.

What It Can Do

21 Second Backup provides three high speed full disk copy utilities on its accompanying disk. The first utility is the basic copier which will duplicate unprotected disks as well as most basic copy protection schemes.

As mentioned above, this can be done in as little as 18 seconds, with verify off, using two disk drives. If you are using only one disk drive, most of your time will be spent on the five pairs of disk swaps required to copy a disk. The actual single drive disk time is less than 35 seconds.

If the verify option is turned on, the two drive copy time increases to 30 seconds. We are not certain just what is verified by the latter option. We found the program would copy a disk to a second drive without a disk in it and nary a peep that anything was amiss.

The second utility is a "super" copier which handles the newer synchronization copy protection schemes. This copier analyzes the entire disk, out to track 40, to determine the type of protection before doing the actual copying. The third utility is similar to the second with the inclusion of half-tracking. All the copiers function automatically with no user-settable parameters other than the selection of the copier and the verify toggle.

The addition of the external parallel channel between the 1541 and the C-64 should give *21 Second Backup* the ability to copy more forms of copy protection than any purely software driven nibble copier. Interestingly enough, the *21 Second Backup* program disk is copy protected and it will not copy itself! Not unexpectedly, there are several forms of copy protection on the market which are resistant to any and all 1541 copy schemes due to the built-in limitations of the disk drive's hardware.

As with other nibble copiers, *21 Second Backup* relies on parameter files to handle these uncopyable schemes. The parameter list provided with Version 4.1 of *21 Second Backup* contained only a single entry for Accolade Software. Interestingly enough, it did not work on the copy of *Fight Night* upon which we tried it.

VG Data Shack justifies the limitations on what *21 Second Backup* will copy by saying that "(allowing the program to copy everything) would quickly accelerate the advance of copy protection." We feel that this

statement makes as much sense as putting copy protection on a copy program.

Installation Notes

We remind you that installing *21 Second Backup* does require you to open up the 1541 disk drive and pry out a 40 pin chip. If you are using an SX-64 you will have to open up the computer itself. Access to the disk drive VIA chip on the SX-64 is far more difficult than on the 1541 disk drive. *21 Second Backup* also expects both disk drives to be device number eight. This may be cumbersome to 1541 users who have modified their second drive as a permanent device nine by cutting the printed circuit trace.

The connections to the paper thin printed circuit boards on which the 40 pin DIP sockets are mounted are fragile. The spacing between socket pins is only 1/10 of an inch. Perform the installation carefully while paying particular attention to pin alignment. The 40 pin DIP sockets use open frame construction. When removing the VIA chips, take care to avoid damaging the disk drive's printed circuit traces which run under the socket.

The VIA chip can be damaged by static electricity discharging from your body. We haven't the space to expand on the ways of controlling static electricity. Note that hot and muggy summer days, without air conditioning, will reduce static buildup. In any case, avoid direct contact with the VIA's pins.

The connection to the disk drives never gets in the way of any 1541 operations, since the disk drive VIA port used by *21 Second Backup* does not really exist as far as the 1541 DOS is concerned. The connection to the computer's user port will have to be removed to permit the use of accessories such as modems.

Once *21 Second Backup* is started up the disk drive motor spins continuously. The drive cannot be turned off, as this would wipe out the custom code which is downloaded to the disk drive's RAM. We have some reservations with regard to the ability of the disk drive's motor or its power supply to continuously operate in this fashion for long periods of time. We would appreciate hearing from anyone with experience in this matter.

The latest version of the 1541 disk drive is not fully compatible with *21 Second Backup.* It cannot be used to load the program; however, it may be used as the destination drive in a two-drive setup. The new drive may be recognized by the brief spin of the disk which is performed immediately after insertion.

Conclusions

21 Second Backup is definitely the fastest dual drive copy program available for any disk drivé. In view of the built-in limitations of the 300 RPM speed, we do not expect to see anything faster. The copiers worked reliably and consistently. However, the built-in verify routines seem to need some work. The package is well worth considering by anyone who frequently needs to duplicate entire disks.

VG Data Shack, 5625 Grand Allee Blvd., Loc (5), Brossard, Quebec, Canada J4Z 3G3 (phone: 514-445-9663). *—Morton Kevelson*

INTRACOURSE

IntraCorp, Inc.
Commodore 64
$49.95, analysis module; $59.95, compatibility module; $99.95, combined

Analysis of sexual styles, preferences, and attitudes is a big moneymaker in today's society. *IntraCourse, The Computer Program For Sex* combines our national interest in sex with the proliferation of home and desktop computers. It offers some combination of educational, therapeutic, and recreational features.

IntraCourse is a computerized questionnaire/analysis. Readers of *Penthouse, Cosmopolitan*, and their ilk will be familiar with this type of instrument—at least in its printed form. From its hot pink and flesh colored title screens, *IntraCourse* develops into a straight text program of do you, would you, can you, should you....

The C-64 version of *IntraCourse*

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The publisher cannot assume responsibility for errors in the above listing.

is supplied on four disks. This indicates the amount of text the programs have to choose from as they question, analyze, and compare you. *IntraCourse* is totally menu-driven and offers five primary options.

First, you'll want to create your sexual profile by answering 50 to 100 multiple choice questions. Depending on your answers to specific questions, the program may branch to other questions that explore the detail of your previous answers. Answers that might be characterized as traditional will result in the shortest series of questions.

Questions are shown two at a time with answers picked by the arrow keys. For each pair of questions, you must confirm that your answers are correct. You cannot review or revise your answers any time after that without redoing the whole profile—a 15 to 30 minute process.

Using the multiple choice format has inherent limitations. When you're asked if you do...never, occasionally, often, or always, the format works. When you must choose which of a series of descriptive words or sentences best fits you, there may be no answer you like (or no answer you don't like), yet you must choose one. Do you, for instance, think sex is based on challenge, conquest, love, intimacy, or lust? Pick one. Do not qualify or amplify your answer. Are you satisfied with that answer?

The second option in *IntraCourse* is to analyze your sexual profile. With Epyx's *Fast Load* or another disk speedup program, this analysis will take only a minute or so before it begins to appear on the screen or printer. A full analysis runs from 3 to 15 pages and covers sexual style, sexual personality, special sexual behaviors, and sexual dysfunction. At the end of each section, you'll be referred to published references where you can read more. Citations for over four dozen of these references are listed in the *IntraCourse* manual.

With only 50 to 100 of your answers to draw on, the *IntraCourse* analysis may occasionally surprise you. Based on as few as one or two of your responses on certain topics, the analysis will apply a label to your behavior and then tell you what that label implies clinically. While entering various "personalities," I was surprised that one behavior which I said occurred "rarely" was listed in my analysis as a major dysfunction. According to the program, that particular dysfunction, if it occurs at all, must occur more than 50 percent of the time. I haven't figured out why "rarely" was offered as an answer.

IntraCourse's third option lets you compare your sexual profile to published statistics. Fourteen of your specific answers are compared to national statistics and a bar chart is shown onscreen. You'll see what proportion of people do...never, occasionally, often, or always, and which group you fit into.

Fourth, you can compare your sexual profile with someone else's for compatibility. You'll see twelve bar graphs showing where you fall in ranges like dominant/submissive, comfort/discomfort, and intimate/distant. Then you'll see a compatibility analysis for you and the chosen "other."

This analysis uses the paired terms, but never really describes or defines them. In about two pages, it will focus on the different styles, preferences, and biases of the two people, and make general suggestions on how best to adapt. If you like crowds, and your "other" is more solitary, it may suggest that you each cultivate nonsexual relationships with friends more like you. Although a print option is offered for the compatibility profile, I could never get it to print.

Just for fun, I asked for a compatibility profile on two of my hypothetical characters—Mr. Macho and Mr. Milktoast. Both are avowed and dedicated heterosexual males. On a score of 0 (incompatible) to 100 (highly compatible), I expected them to get about a 3. When this unlikely pair scored over 70 percent compatibility I nearly slid out of my chair.

The fifth major option on the *IntraCourse* main menu is to access a sex dictionary. It is supposed to define scientific and popular terms you may encounter in the program. I could never get the dictionary option to work. I would either be returned to the main menu or, if I tried to get to the dictionary from the analysis module, the program would crash.

I started by saying you could perceive *IntraCourse* as educational, therapeutic, or recreational. As an educational program, it will almost certainly teach you a few new terms (though perhaps for old activities). And it will tell you how you compare statistically. Are you in the 7 percent group or the 93 percent group? It may be important to know.

As a therapeutic device, it's not. Right there, at the bottom of page 13 in the manual, it says (and I paraphrase): What we've told you is for information and entertainment, it's not necessarily accurate, and you should see a professional if you want a professional diagnosis. There's something about computers, though. They're credible. We look at computer printouts and we don't question them. *IntraCourse* analyses cannot be read that seriously.

If you're a psychological hypochrondriac, you'll find out that you may be things you didn't even know existed. *IntraCourse* encourages you to be honest and open; it even provides password security. You may tell your C-64 things you'd only tell your dog otherwise—and only when he's asleep.

As an entertainment program, *IntraCourse* has real potential. If you'd like to sit down with a group of friends and let the computer suggest who "really" ought to be paired up with whom, you could have some fun. Or spend an evening by yourself trying on personalities and seeing which ones are the most interesting.

IntraCorp, Inc., 13500 SW 88th Street, Suite 185, Miami, FL 33186 (phone: 1-800-INTRACO or 305-382-6567). *—Richard Herring*

All the programs in this issue of Ahoy! are available on disk. See page 54 for details.

ATTACK FORCE

For the C-64 By Mike Hoyt

In the distant future, the earth has been captured by aliens who need to mine it for precious minerals their civilization depends on for survival. They do not care for the welfare of the humans, whom they treat as beasts.

A few humans escaped and mounted an attack on the alien bases. But the aliens were prepared for an offensive, having surrounded themselves with heavily armored fortresses. And so earth's only hope of liberation was lost.

But hope was revived when your fleet of Omega fighters arrived to exterminate these evil aliens. You must penetrate nine fortresses and destroy all the alien command bases, using your four Omega fighters. If you succeed, the earth will be free again. However, if you fail....

HOW TO PLAY

Enter the program listing on page 106 and save it to tape or disk. Type RUN press RETURN. In a few moments you will be presented with a screen allowing you to select the difficulty level using the f1 key. The difficulty level determines which fortress you start at. Press the f3 key when you are ready to begin.

At the front of each fortress you will be told how many bases you have left to destroy before you can advance to the next fortress. After the warning alarm stops, you begin your raid.

You have complete control over your ship's motion. Using a joystick in Port 2, you can move the Omega fighter in eight directions, as well as fire your twin lasers by pressing the joystick trigger.

There are many obstacles in your way. These include electro-barriers, walls, bombs, and the aliens' defense saucers. You must maneuver around the walls and the electro-barriers, but you can destroy the saucers with your lasers. The bombs pose yet another problem. You cannot see them, but you can hear a whistle as they fly toward you. The scanner at the lower right of your screen shows about where the next bomb will land (a red dot).

The bases, which are towers, can be easily destroyed with a single blast from your lasers. When you destroy enough bases, you will receive a bonus for the amount of fuel you have left (if the fuel runs out, your ship crashes). Then you will proceed to the next fortress with a full tank. ☐ *SEE PROGRAM LISTING ON PAGE 106*

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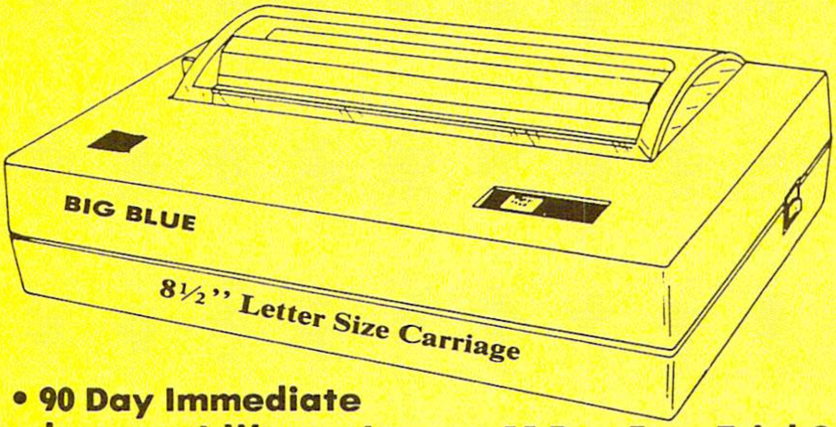
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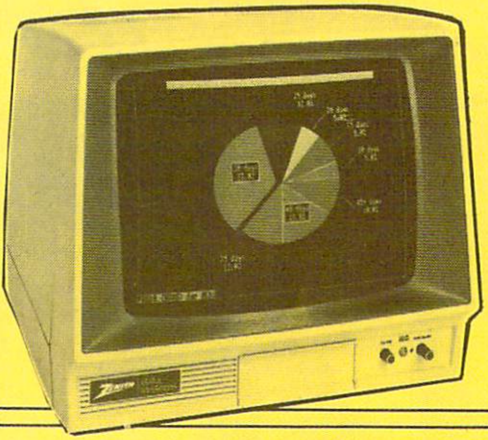
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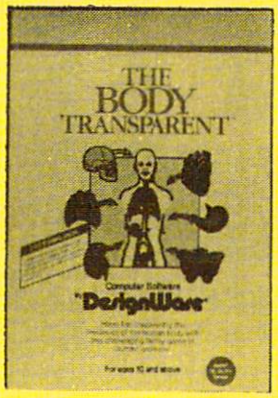
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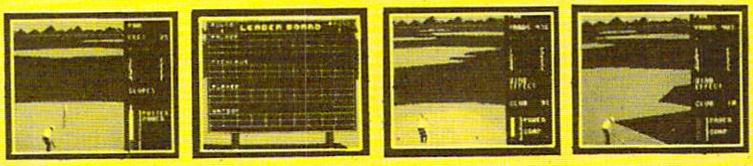
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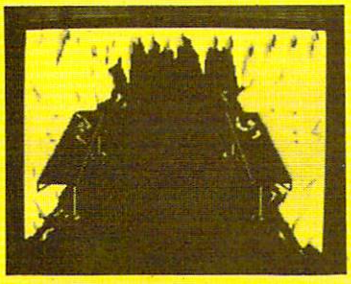


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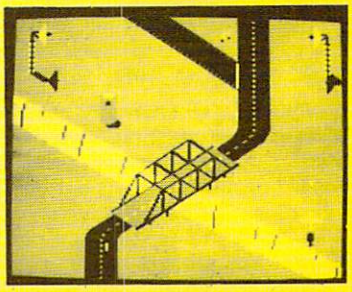
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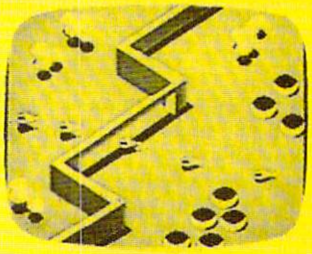
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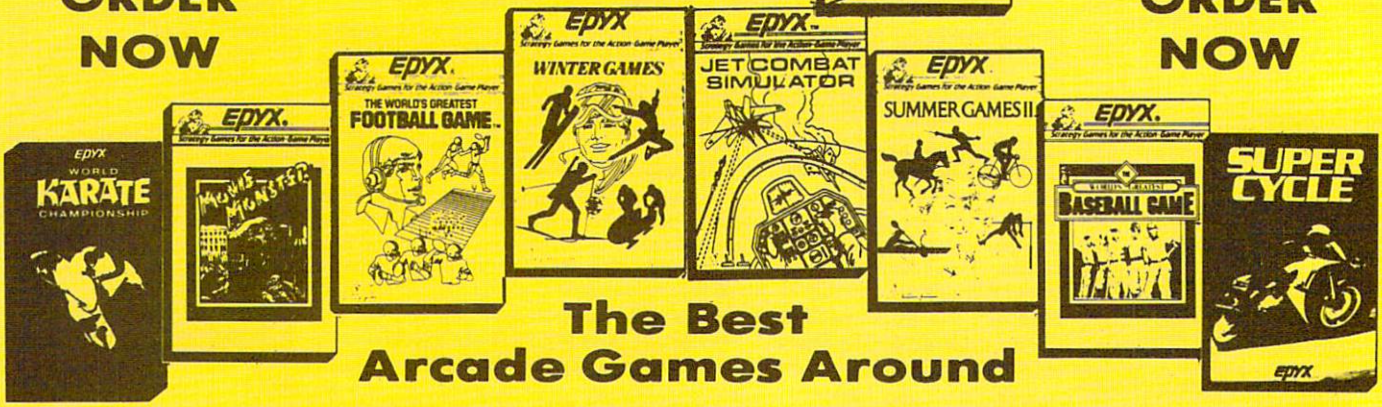
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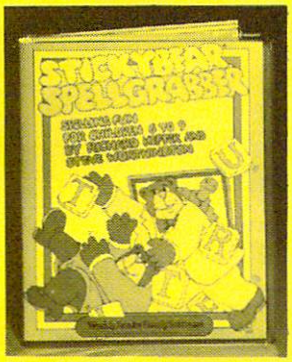
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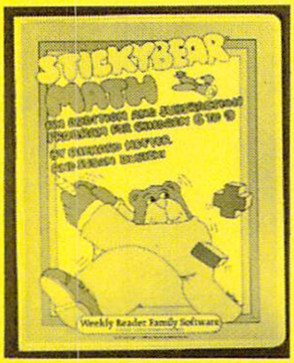
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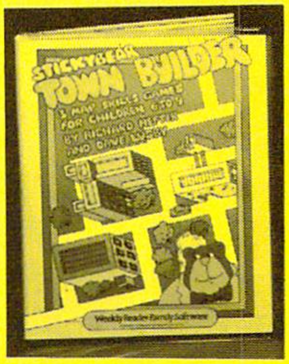
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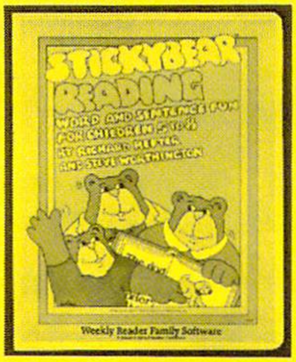


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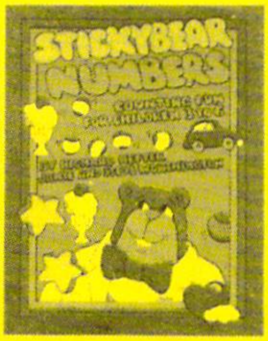




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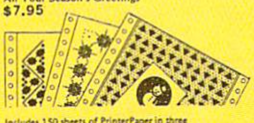
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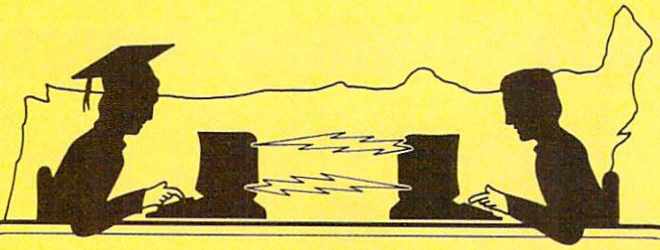
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By Dale Rupert

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We will print and discuss the cleverest, simplest, shortest, most interesting and/or most unusual solutions. Be sure to identify the *name* and *number* of the problems you are solving. Also show sample runs if possible, where appropriate. Be sure to tell what makes your solutions unique or interesting, if they are.

Programs on diskette (1541 format only) are welcome, but they must be accompanied by listings. You must enclose a stamped, self-addressed envelope if you want any of your materials returned. Solutions received by the middle of the month shown on the magazine cover are most likely to be discussed, but you may send solutions and comments any time. Your original programming problems, suggestions, and ideas are equally welcome. The best ones will become *Commodares*!

PROBLEM #34-1: DISTANCE FINDER

This problem was inspired by a suggestion from Yuk Hung Mak (Curacao, Netherland Antilles). The user specifies the width (W) and height (H) of a grid (such as 320 and 200 for the C-64 graphics screen). Assume the points in the grid are numbered sequentially from 1 to (W times H). The user specifies two points A and B which are each between 1 and (W times H). The computer calculates the straight-line distance between those two points.

An example will clarify the problem. If W=320 and H=200, point number 1 is in the upper left corner of the grid. The upper right corner is point number 320, since the grid is 320 units wide. Point number 321 is at the left edge of the second row, and number 640 is at the right edge of that row. The bottom left and right corners are numbered 63681 and 64000 respectively. The distance from point 1 to point 63681 is 200 (top left corner to bottom left corner). The distance from point 1 to point 320 is 320 (top left corner to top right corner). The distance from point 1 to point 64000 is 377.36 with help from our friend Pythagoras.

PROBLEM #34-2: GREASED IGPAY

We are honored with this challenge from Dr. Petrie Curryfavor, CyberCryptographer and Professor of Obfuscation, as submitted by his colleague and alter ego Eddie Johnson (Albuquerque, NM). The user enters a word, and the program translates the word into Pig Latin. The good doctor is absolutely certain that no one can beat his 95-byte, 3-line Pig Latin translator program. Urelsay omesay ofway ouyay ancay oday etterbay anthay atthay, ichtnay ahrway?

PROBLEM #34-3: DIGIT DECOMPOSITION

The user enters any positive integer up to nine digits long. Write a program to print out the individual digits and their sum. If the user enters 1234, the computer displays "1 + 2 + 3 + 4 = 10." One slight catch: no strings (except the "+" and "=") and no string functions are allowed. Still an easy problem, isn't it?

PROBLEM #34-4: SIX COUPLES

Here's a good one from around the world, submitted by Necah Buyukdura (Ankara, Turkey). Using the first letters of the first names of twelve people (six couples), we are told:

C, F, P, Q, and T are YOUNGER;
A, D, E, F, and Q are TALLER;
D, P, Q, S, and T are DARKER;
and A, C, P, S, and U are SLIMMER than their spouses.

(B and R are not mentioned above.)

Write a program that will deduce and then print six pairs of letters, each pair giving the first name initials of each couple.

We received several good explanations for the "PRINT CHR$(34)" puzzle/bug mentioned at the end of the June *Commodares.* The problem was to explain why

```
PRINT MID$(CHR$(34),1);2;3
```

prints reverse-video right brackets after the two and the three. The explanation is that printing CHR$(34) puts the computer into the "Quote/insert" mode. In this mode, cursor movements show up as special symbols. In particular the cursor-right mode is a reverse-video right bracket. When the computer prints the number "2," it prints a space where the optional minus sign might be in front of the digit, and it also prints a cursor-right character after the digit so that there is a gap between a number and whatever follows it.

Try this example from Art Shipman (Westbrookville, NY). Move up to the line just above the READY on your

screen. Type in direct mode PRINT 1"X" and press <RETURN>. You now see " 1AXY." where "READY." was. The "RE" is replaced by the leading space and the digit. The "A" is skipped over by the cursor-right, and the "X" is printed.

Art sent the following program to provide further insight into how the Quote mode works.

```
•1 REM QUOTE MODE DEMO BY ART SHIPMAN
•2 PK=244 : IF LEN(DS$)=0 THEN PK=212
•3 Q$=CHR$(34)
•4 PRINT Q$;PEEK(PK);:GOTO 4
•5 PRINT Q$;:POKE PK,0:PRINT PEEK(PK);:GO
 TO 5
•6 PRINT Q$;:POKE PK,1:PRINT PEEK(PK);:GO
 TO 6
```

Line 1 sets PK to the address of the Quote mode flag. For the C-128 the address is 244. If DS$ has a length of zero, then the program is being run on the C-64, and PK is changed to the appropriate value of 212. Q$ is a quotation mark. Line 4 is executed repeatedly until you press the RUN STOP key. You will see the quotation mark followed by the current value of the Quote mode flag (1) and the right bracket discussed above. The next time line 4 is executed, another quotation mark is printed followed by the number zero (without the right bracket), indicating that the computer is no longer in the Quote mode.

Press RUN STOP and type GOTO 5. This line repeatedly takes the computer out of Quote mode by POKEing 0 into address PK. No more right brackets are displayed. Press RUN STOP again and type GOTO 6. Now the computer is consistently put into Quote mode, and the " 1]" is continuously displayed. Art even suggested a reason for the use of the right bracket. In the *1541 User's Manual* under the PRINT# section, it mentions that CHR$(29) is used as a delimiter between numbers in sequential files. A trailing space would be indistinguishable from a leading space, so a different character (the right bracket) is used. Change the semicolons after Q$ to commas in lines 4, 5, and 6 and you will see a string of right brackets corresponding to the number of cursor-rights inserted by the computer to move the cursor to the next tab column. Thanks to Art as well as to Harold Garter (Phoenix, AZ), Rick Rothstein (Trenton, NJ), Charles Grady (Cleveland, TN), and Jim Speers (Niles, MI) for all this information. After running the program above, predict or explain the output from PRINT Q$,C if you can. Hint: The 0 corresponds to the value of C.

Back to reclaim his title for the "World's Longest Listable Line" is James Borden (Carlisle, PA). Jim's program for the C-64 includes a machine language patch to the LIST code to allow lines longer than 256 characters. His program copies BASIC from ROM into RAM in order to change the LIST code. Then it fills memory with a one-line program consisting of a line number, three zero bytes at the end, and 38,904 "RESTORE" tokens (hex BC). A SYS call causes this Superline to be listed. By Jim's calculations, it is 272,337 characters in length and requires six minutes to list. If you are interested in Jim's machine language routine and BASIC program, send me a self-addressed, stamped envelope, with your request clearly stated, to *Commodares*.

Now on to the *Commodares* from the June issue. All of the solutions to *Problem #30-1: Functional Entry* used the dynamic keyboard technique. The problem suggested by Glen Bohusch (Erie, PA) was to allow the user to run a program, type an expression for a user-defined function, and have the program evaluate that function for various values. The solution from S. Simonetti (Glen Rose, TX) is listed below.

```
•1 REM COMMODARES PROBLEM #30-1:
•2 REM   FUNCTIONAL ENTRY
•3 REM SOLUTION BY
•4 REM       S. SIMONETTI
•5 REM
•8 K1=842 : CT=208 :REM  KBD BUFFER
•9 IF LEN(DS$)=0 THEN K1=631 : CT=198
•10 PRINT"DEFINE THE FUNCTION FNA(X) = "
•20 INPUT A$
•30 PRINT"[CLEAR][3"[DOWN]"]50 DEF FNA(X)
 ="A$ : PRINT"GOTO50[HOME]"
•40 POKE K1,13:POKE K1+1,13:POKE CT,2:END
•100 FOR X=1 TO 10 : PRINT FNA(X) : NEXT
```

This program runs on the C-64 and the C-128. The keyboard buffer and queue counter are in different locations in the two machines. Line 8 assumes a C-128 is being used. If the program is run on a C-64, line 9 changes the start of the keyboard buffer variable and the queue counter to their proper values. The variable DS$ is a special disk status variable for the C-128 only. On the C-64 it is normally a null string.

Line 30 positions the cursor and prints the function definition on the screen with the GOTO 50 statement below it. Line 40 stuffs the keyboard buffer with two Return codes and tells the queue counter that there are two characters waiting. When the program ends in line 40, the two Returns are processed. The first enters the new line 50, and second causes the program to GOTO 50 where the function is defined and execution continues.

Other readers went to the trouble of printing the added screen lines in the background color so that line 50 and the GOTO 50 were invisible. Jim Speers (Niles, MI) suggested adding these lines to do that for the C-64:

```
25 POKE251,PEEK(646):POKE646,PEEK(53281)
55 POKE646,PEEK(251)
```

For the C-128, replace the 646 with 241. Line 25 saves the current character color whose value is in location 646 (241 on the C-128) and replaces it with the background color whose value is in address 53281. Line 55 restores the original color. Location 251 is an available zero page RAM address. On the C-64, the original color value must be stored in RAM rather than in a variable, since variable values are lost when line 50 is added to the program.

Problem #30-2: What Environment turned out to be too much of a challenge for everyone except Jim Speers (Niles, MI). Jim's solution is printed below.

```
•1 REM COMMODARES PROBLEM #30-2:
•2 REM      WHAT ENVIRONMENT?
•3 REM SOLUTION BY
•4 REM      JIM SPEERS
•5 REM
•100 DIM C$(32):FORI=1 TO 32:READ C$(I):N
 EXT
•110 DATA BLACK,WHITE,RED,CYAN,PURPLE,GRE
 EN,BLUE,YELLOW,ORANGE,BROWN,LIGHT RED
•120 DATA DARK GRAY,MEDIUM GRAY,LIGHT GRE
 EN,LIGHT BLUE,LIGHT GRAY,BLACK,WHITE
•130 DATA DARK RED,LIGHT CYAN,LIGHT PURPL
 E,DARK GREEN,DARK BLUE,LIGHT YELLOW
•140 DATA DARK PURPLE,DARK YELLOW,LIGHT R
 ED,DARK CYAN,MEDIUM GRAY,LIGHT GREEN
•150 DATA LIGHT BLUE,LIGHT GRAY
•160 Z=FRE(1)-65536*(SGN(FRE(1)<0)):IFZ>4
 0000 THEN 190
•170 IF Z<37000 THEN 260
•180 GOTO 250
•190 PRINT"COMMODORE 128":X=RGR(0)
•200 IF X>=5 THEN PRINT"80 COLUMN MODE":P
 RINT"SCREEN COLOR= ";C$(16+RCLR(6)):GOTO
  300
•210 IF X=0 THEN PRINT"40 COLUMN MODE":PR
 INT"PRINT COLOR= "C$(RCLR(5)):GOTO 280
•220 IF X>0 AND X<5 THEN PRINT"BIT MAP MO
 DE":GOSUB 310:END
•230 PRINT"BORDER COLOR= ";C$(RCLR(4))
•240 PRINT"PRINT COLOR= ";C$(RCLR(5))
•250 PRINT"COMMODORE 64":PRINT"40-COLUMN
 MODE":GOTO 270
•260 PRINT"VIC 20":PRINT"20-COLUMN MODE"
•270 PRINT"PRINT COLOR= ";C$((PEEK(646)AN
 D15)+1)
•280 PRINT"SCREEN COLOR= ";C$((PEEK(53281
 )AND15)+1)
•290 PRINT"BORDER COLOR= ";C$((PEEK(53280
 )AND15)+1):IF X<>5 THEN END
•300 PRINT"PRINT COLOR= ";C$(RCLR(5)+16):
 END
•310 CHAR1,0,1,"COMMODORE 128":CHAR1,0,2,
 "BIT MAP MODE"
•320 X$="BORDER COLOR= "+C$(RCLR(4)):CHAR
 1,0,3,(X$)
•330 X$="SCREEN COLOR= "+C$(RCLR(0)):CHAR
 1,0,4,(X$)
•340 X$="PRINT COLOR= "+C$(RCLR(1)):CHAR1
 ,0,5,(X$):CHAR1,0,6,STR$(RGR(0))
```

The problem was to write a program which could determine the type of computer as well as the operating modes and screen colors of the computer on which it is being run. Since the program contains some of the new C-128 commands, it gives a SYNTAX ERROR when LISTed on a C-64, but it will run on a VIC 20 and a C-64 (as well as a C-128), since the offending lines are never executed on those machines. Notice how Jim determined the type of computer in lines 160 and 170. The amount of free memory is the key. If this is part of a long program, the numbers in those lines might have to be changed. Lines 310 through 340 allow this program to handle even the C-128 bit-map mode. If you are writing software that may be run on various machines, you should consider using some of the ideas of this program.

We received several good solutions to *Problem #30-3: Word Wrapper* which was originally submitted by Jim Speers. Of all the solutions, Jim's own solution is the most versatile. It is listed below.

```
•1 REM COMMODARES PROBLEM #30-3:
•2 REM      WORD WRAPPER
•3 REM SOLUTION BY
•4 REM      JIM SPEERS
•5 REM
•10 L$="[LEFT]":B$=" ":FORI=1TO79:LL$=LL$
 +L$:BL$=BL$+B$:NEXT:D$=CHR$(20)
•20 Q$=CHR$(34)+CHR$(20)+CHR$(34):WL=0:LL
 =0:C$="[c P]":PRINT"[CLEAR][DOWN]"C$;
•30 GETZ$:IFZ$="" THEN 30
•40 IF Z$="[BACKARROW]" THEN PRINT L$;B$:
 END
•50 X=ASC(Z$):IF X=32 THEN WL=0:W$="":LL=
 LL+1:PRINT L$Z$C$;:GOTO 140
•60 IF X=34 THEN PRINT L$Q$C$;:WL=WL+1:LL
 =LL+1:WL$=WL$+Q$:GOTO 140
•70 IF X=13 THEN PRINT L$B$:PRINT C$;:LL=
 0:WL=0:W$="":GOTO 30
•80 IF X<>20 THEN 120
•90 PRINT D$D$C$;:LL=LL-1:IF WL>0 THEN WL
 =WL-1:W$=LEFT$(W$,LEN(W$)-1)
•100 IF LL<0 THEN LL=LL+80
•110 GOTO 30
•120 IF (X>16ANDX<32) OR (X>127ANDX<160)
 THEN 30
•130 PRINT L$Z$C$;:W$=W$+Z$:WL=WL+1:LL=LL
 +1
•140 IF LL<81 THEN 30
•150 IF WL=0 THEN 30
•160 PRINT LEFT$(LL$,WL+1)LEFT$(BL$,WL-1)
 W$C$;:LL=WL:GOTO 30
```

The versatility comes from the fact that there are no PEEKs or POKEs, and no assumptions about screen memory locations. Consequently it is very easy to adapt Jim's program for screens of any width. To use this on the C-128 with an 80-column screen, just make these changes:

Line 10: change 39 to 79 (one less than screen width)
Line 100: change 40 to 80 (equal to screen width)
Line 140: change 41 to 81 (one more than screen width)
Jim uses the <BACK ARROW> as the escape key for

this program. Press it when you are done typing.

Other very good solutions to this problem were from Paul Sobolik (Pittsburgh, PA), Steven Steckler, and Ben Margolin (Detroit, MI). Congratulations to Ben and the rest of the computer team at Renaissance High School who are three-time city champs, and who made it to the international championships in Detroit this year.

It was easy to separate the correct solutions from the incorrect ones to *Problem #30-4: Color Bars.* The readers who felt that it was very likely for the screen to eventually be filled with one color generally misinterpreted the problem. The length of each character bar to be printed was determined by the greatest number of consecutive repetitions of any one color previously chosen, where colors were randomly chosen from 16 possibilities. Until two consecutive matching colors are randomly chosen, color bars are printed singly. After the first occurrence of two consecutive matching colors, color bars are each printed two characters in width. This continues until three consecutive matching colors are chosen, after which color bars are printed which are each three characters wide. And so forth.

The solution from Bing Perry (Monterey, CA) is listed below.

```
•1 REM COMMODARES PROBLEM #30-4:
•2 REM      COLOR BARS
•3 REM SOLUTION BY
•4 REM      BING PERRY
•5 REM
•10 CLMEM=241 : IF LEN(DS$)=0 THEN CLMEM=
646
•20 PRINT CHR$(147);:HLD=0:REP=1:CTR=1
•30 RNR=INT(RND(0)*16)
•40 POKE CLMEM,RNR:FOR I=1 TO REP:PRINT C
HR$(65+RNR);:NEXT
•50 IF RNR=HLD THEN CTR=CTR+1:GOTO 70
•60 CTR=1
•70 IF CTR>REP THEN REP=CTR
•80 HLD=RNR : GOTO 30
```

It is representative of most of the correct solutions. Bing's program displays colored letters, for easier interpretation. Most readers used "<RVS ON><SPACE><RVS OFF>" as the color bar character. In the program above, HLD is the last color selected; REP is the greatest number of repetitions so far; CTR holds the current number of repetitions of the selected color; and RNR is the current number from the random number generator.

Line 10 allows the program to be run on the C-128 and the C-64. The character color memory location is 241 on the C-128 and 646 on the C-64. C-128 users may want to add PRINT "<CONTROL-G>" at the end of line 70 so that the computer beeps whenever the color bar length changes.

True to form, Jim Speers did an interesting analysis of the likelihood of the screen ever being one color. The color bar must reach a length of 32 for the screen to be a solid color, since 32*32 is greater than the 1000 characters needed to fill the screen. That means that the same random number must occur 32 times in a row, and that's not very likely at all. Based upon some preliminary timing and the results of a simulation program he wrote, Jim concluded that it would take on the order of 10^{28} years (that's one with 28 zeros after it) on the average for the screen to be one color. Jim points out that this assumes the random number generator is truly random. In actuality it generates a very large but finite group of numbers. If in that group there is no occurrence of 32 consecutive numbers which are the same, the solid color screen will never happen.

Alain Goyette (Gander, Newfoundland) wrote an assembly language program to solve this problem. He and Scott Nicodemus used the random noise generator of the SID chip to generate random numbers as described in *Tips Ahoy!* in the June issue. In BASIC,

```
POKE 54287,255 : POKE 54290,128 : R=PE
EEK(54299)
```

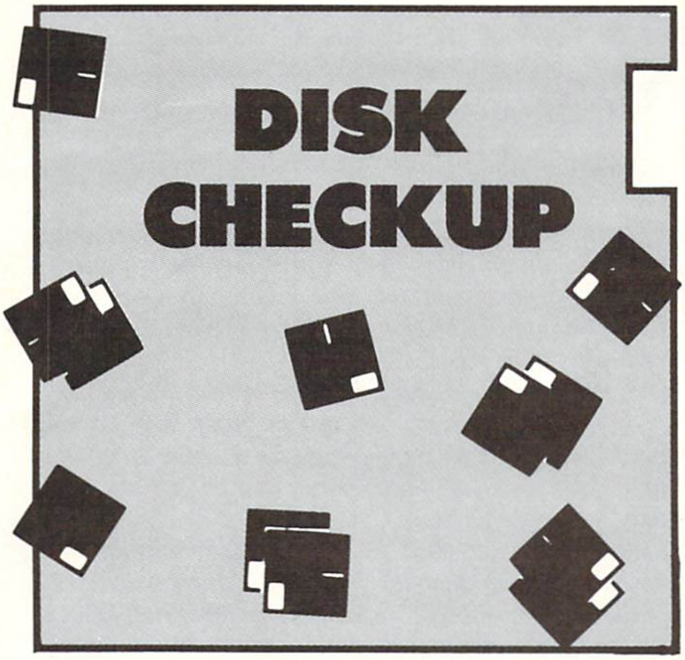
selects a random number R from 0 to 255. Scott used R=(PEEK(54299) AND 15) to choose his random numbers from 0 to 15. Alain ran his BASIC program for three days and never got a color bar of length greater than five. His assembly language program did better with a length of 13.

Jim Speers concluded that a VIC 20 using only two possible colors on its 22 by 23 screen should produce a solid-colored screen in only 29¼ hours. With the eight colors of the VIC, waiting for a color bar 23 characters long should take a mere 46,000,000 years.

Congratulations also to these readers not already mentioned this month: Dean Holmes (St. Petersburg, FL), Will Ludwigsen (Port Charlotte, FL), Karen Middaugh (San Diego, CA), Mark Breault (Brandon, MAN), Daniel Brumbaugh (Chambersburg, PA), Michael Jacknis (Dix Hills, NY), Craig Ewert (Crystal Lake, IL), Pete Baker (Rio Oso, CA), Tony Mannucci (Berkeley, CA), and Jimmy Wong (San Francisco, CA).

One final challenge. Paul Sobolik (Pittsburgh, PA) used the dynamic keyboard to solve *Problem #30-1: Functional Entry,* just as everyone else did. Paul said he worked on trying to devise a way to POKE the definition of the function into the program text, but he found the task of tokenizing too complex. He asked if there is a way to use BASIC's CRUNCH ROUTINE (at $A579 in the C-64) to do this. Or how about writing the string defining the function to a disk file and then merging it with the rest of the program? Any thoughts and examples you can come up with will be appreciated.

Don't wait around for your screens to fill with color bars. Get busy on this month's challenges. If these are too easy for you to bother with, send us some harder ones. If these are too hard for you to figure out, send us some easier ones that you have solved. See you next month. □



For the 1541 and the C-64, Plus/4, C-16, and VIC 20 (+8K)

By Donald Fulton

What with the bugs that seem to inhabit the Commodore DOS, it pays to periodically check the health of your files. It's not too well known that there is enough redundancy in the Commodore DOS to allow files to be checked very thoroughly. For example, the number of Blocks Free on the disk can be figured three ways: from the directory, from the BAM, and from the actual files. *Disk Checkup* displays all three. In a healthy disk all three should agree. An exception is some commercial disks that may use a nonstandard BAM or directory.

Disk Checkup, however, does much more than display three Blocks Free. It thoroughly checks each file in the directory. In testing this program on three of my heavily used working disks, which contained about 150 files, I found three previously undetected problem files. *Disk Checkup* first displays an expanded directory, including the starting track and sector of each file, and then checks that all files start at different track and sectors. This is a quick check that will detect the most common DOS file error: two directory entries pointing to the same file.

Disk Checkup then proceeds to trace each file. If the traced block count does not agree with the directory block count, the file is displayed in inverse video. The directory block count was the number of blocks in the file when it was saved, so if the block counts disagree, either the file is a different file than shown in the directory, or part of the file has been lost.

Disk Checkup will detect any case of file overlap, including partial overlap, because it checks each block for overlap during the trace. If a problem is found, the overlapping files are identified. Unlike Validate, *Disk Checkup* will not abort if it encounters an illegal file link, i.e. a link to a nonexistent track or sector. If it encounters an illegal link during a trace, it prints an illegal link message, and continues with the next file.

It is not necessary to monitor *Disk Checkup* while it works, since tracing all the files on a full disk can take a few minutes. On the final screen *Disk Checkup* displays a full status report on the disk files and three Blocks Free. To bring a problem disk back to health, a general guideline is to first Validate (Collect) the disk, delete any problem files, and Validate again.

Disk Checkup is safe to run on all disks because it does not write to the disk. If a disk contains REL files, they may be incorrectly identified as problem files, because REL files use a different directory format from PRG, SEQ, or USR files. *Disk Checkup* is written in 2.0 BASIC in a structured format, yet with an eye to speed. The program includes many REM statements that may be omitted if desired. ☐ *SEE PROGRAM LISTING ON PAGE 128*

S.O.S.

By Tim Little

My friends and I write BASIC programs, and we have heard of tricks and techniques that will allow our programs to run faster. Using these techniques, is it possible to write arcade-speed games without machine language? Also, could you tell us what kind of techniques we could use to speed up our BASIC programs?

Due to the way the BASIC language is translated by the C-64 and C-128, commercial quality animated action games are very difficult to implement successfully. BASIC is interpreted statement by statement, each statement taking possibly dozens of machine language steps to execute, not including the time or effort the BASIC interpreter spends just parsing (decoding) your program line into separate byte-sized pieces. The most efficient method of programming such a game would be to use machine language (actually assembly language would be the correct term, but the two are more or less interchangeable) which is not as difficult as you may think. So to answer your first question, arcade speed games are extremely difficult if not impossible without at least some machine language routines.

As for your second question, I will just list the techniques, as an explanation would be far too lengthy to print on this page:

1) Use variables instead of numbers whenever possible. For example:

```
AD = PI * RD
```

will execute much faster than

```
AD = 3.14 * 15
```

2) Put all commonly used subroutines in the beginning of your program. This is probably the opposite of what you were taught, and will require extensive rewriting of your program, but if you are trying to write fast code this is a must.

3) Replace the number 0 (zero) with a period (.).

4) Integers are supposed to run faster than floating point numbers, but timing program execution proves this to be false. So use floating point, even though the latter may use more memory.

5) While using FOR/NEXT loops, don't name the variable of the loop after the NEXT–it was intended to be optional on most home micros. An example should clear up any problems:

```
FOR X = 1 TO 1500 : NEXT
```

will run faster than

```
FOR X = 1 TO 1500 : NEXT X
```

That last X slows it down.

6) Lastly, remove all REMs and extra spaces, and put as much text on one line as possible.

All of the above is technically known as bad programming technique, but it works.

Seeing so many programs in all the Commodore magazines, I wondered what the formula for converting the SYS, PEEK, and POKE addresses from the C-64 to the C-128 would be.

Unfortunately, the simple answer is that ~~no~~ such formula exists. Although from a logical standpoint, it might seem that one would just multiply every address by two and let the program go at that, this just won't work.

The C-64 has ROM from $A000 to $BFFF and from $E000 up. Saved within the ROM is the operating system, the program that controls every function of the C-64 from checking the keyboard for recent input to interpreting your BASIC programs. The ROM is a machine language program and even has variables that can be easily changed by a programmer. Since the C-64 and the C-128 don't have identical operating systems, and because of the myriad of differences between the two machines, a formula is impossible.

What you can do is consult a memory map, a book that describes the function of most of the addresses in a specific machine, for both machines and look for similar labels (a label is a six letter name given to an address or routine) or functions for the given address.

ERRATUM

ESCAPE FROM SKULL CASTLE (July '86)

Five @ symbols were missing from the end of line 618 as printed. The error will cause an incorrect *Bug Repellent* code to be printed for that line, but will cause no other problems. To generate the correct *Bug Repellent* code, enter the line as follows:

```
618 PRINTTAB(21)"[RVSON][BLACK]NOP[RVSOF
F] [RVSON]QR[BLUE][3"@"][BLACK]@[BLUE][6
"@"]
```

Also, several readers reported incorrect *Bug Repellent* codes for all the data statement lines (1000-1178). This will occur if a user types in any line within the program with an incorrect number of quotation marks.

VAULT OF TERROR

Continued from page 61

Wand: battles magic with magic. Good for those invisible walls you keep slamming into, or hitting spirits.

Key: unlocks doors. You must be facing a door to unlock it. If the door opens, you will hear a hiss, or a beep if it is still locked.

Gold: heavy stuff. Need it to win the game, but you may have to drop it to get everything up that ladder.

Crown: you have to be clever indeed to find the hidden location of this treasure.

Not long after you enter the dungeon, you're sure to meet one of its intelligent, nasty inhabitants—either by running into one of them, or one of them coming looking for you. Your human scent is a dinner bell for the creatures in the dungeon. They are as follows:

Brown Recluse: this spider is a skinny little varmint who is usually carrying a torch, a remnant of the adventurer he had for breakfast. A stroke of the sword or a few raps with the torch will usually kill him, but don't underestimate him. He might get a lucky shot.

Red Tarantula: a deadlier cousin of the Recluse. Carries a sword. A wee bit faster on the draw.

Blue Crypt Rat: carries a shield in his junkpack. Possibly lethal teeth and claws.

Brown Carrion Rat: carries the ring, but doesn't know how to use it; he pulled it off a skeleton. Bigger, badder.

Purple Goblins: the original inhabitants of the dungeon before the Naga arrived. There are only two left alive; the rest perished at the hands of the serpents. Each carries a rope on his backpack and is armed with a scythe and a short sword. Don't fight these guys until you are ready. They wander around on the first level, looking for overzealous newcomers to carve up.

Light Blue Revenant: ghastly undead spirit, a corpse brought to life by the Emperor Naga's sorcery. He has the power of the "Cold touch"—he changes inorganic and organic material into the energy he needs to retain his existence on this plane. May not be fooled by the ring! These horrid friends will take your possessions if they succeed in touching you, and hoard them in a secret and usually well-guarded area of the dungeon.

Green Naga: giant cobra. Fast and powerful. A single hit from this snake can kill you if you are weak.

Emperor Naga (silver): this guy is the worst. He strikes as fast as you do and does more damage. You will have to be either lucky or smart to defeat him. (Hit and run is best.) He will be carrying a sack of gold, but he has hidden his favorite treasure, the crown, somewhere in the dungeon maze.

All of these monsters can be defeated in mortal combat, even the Revenant, but you will find that the wand is a better weapon against the Revenant than the sword.

You can fight and move in the dark, but you will find it much to your advantage to use the torch or the ring for visibility rather than stumble around in blackness. Torches burn for quite some time, but after a while you will see the outline of the dungeon growing dimmer, turning from light grey to medium grey to dark grey to blue and finally black. To replenish the torch you are carrying, drop it, walk away from it until you are in darkness, and turn around, go back, and pick it up again. When you use it the torch will burn brightly again. If the torch should go out on you, your situation is pretty hopeless unless you have placed other torches in strategic locations or you find one accidentally. (The ring could help you get out of a tight situation like this.)

When you do decide to engage a monster in combat, you and he must occupy the same square. You can move forward past a monster, and he can sometimes do the same to you. When you hear the creature's cry, he has entered the same block as you. You can now engage him in battle with your bare hands, torch, or the sword if you have it. The sword is a superb weapon, doing four times the damage of a torch or your bare hands. If you are empty-handed, you will still be able to do slight damage to monsters by pressing the joystick button, even enough to kill one if you are fortunate to hit him enough times!

Merely possessing the shield gives you its protection, so you will never need to use it, only have it, for it to protect you. A flash of red will let you know when you have been wounded. The screen flashes pink when you are lightly struck, orange when you are hit soundly, and dark red when you are gravely wounded. You will know when you strike your opponent by the flash of green and the sound of your slashing blade.

If you are hale and well, the border is black. When you are severely wounded, the border turns yellow. When you are within a single stroke of death, the border turns red. However, the greatest advantage you have over the monsters is that your wounds can heal, while theirs are cumulative until they are killed. Good strategy can entail hitting a creature several times, running away and resting for a while (until the border turns to yellow or black again), and coming back to deliver the death blow.

You do not have to hit the joystick button repeatedly to keep slashing with the sword, simply hold it down to keep raining blows–but a friend of mine claims you can time the strokes better if you keep popping the button.

You grow stronger by spending time in the dungeon and by killing other creatures. Don't take on a creature outside your capabilities, or descend to the maelstrom of the second level, until you are strong enough!

The first level is rather easy–you may be killed several times before you get the hang of it, but eventually you should be able to kill anything with a few blows on the first level. When you are strong enough and you have the rope, you can go down to the serpent's lair, the second level. The second level is the stronghold of the Emperor Naga and his evil servants.

Stand on a block that has an open shaft leading down, HOLD the rope (should be lit in yellow), and press the button. You will hear your descent, and the next screen that appears will be a view with a ceiling exit above you somewhere on the second level. To go back up, you stand on a block that has both a ladder and a ceiling exit, holding the rope, and press the button. You will hear your ascent, and you will be back on the first level. You cannot go up when there is a ceiling exit only, with the exception of the first one you saw when the game started, which is the one you leave through to win the game!

You will notice that the game has true three dimensional graphics, with the creatures closest to you obscuring the ones behind them–and if you look you will even see creatures behind ladders.

In your search for the crown, you will see rooms, coffins, ladders, shafts, and ceiling exits. The coffins cannot be opened. Ladders that stand vacant in corridors are exits to the surface that were sealed off by the Naga. You cannot climb up them without an exit above them.

The rooms are the most puzzling of obstacles. All rooms have four doors. Although a door can be locked from the outside, keeping you out, you can always leave from the inside of a room in any direction if there is a corridor outside that way. The doors are self-latching, however, and will remain locked behind you until you unlock them with either the key or the wand. Then you can pass freely through the door both ways. Because the view of a door from the inside of a room looks identical no matter which direction you face, the only way you can tell you have turned inside a room is the flash of the command bar and a change in your direction indicators. If you are inside a room and you hear a beep when you try to go through a door, indicating it is impassable, it is for one of two reasons: there is a stone wall on the other side, or the door is rusted shut and cannot be opened by (hint) earthly means. When you are outside and hear a beep, the door is merely locked. (Use the key.)

The most confusing obstacle in the dungeon is the invisible barrier, conjured up by the Emperor Naga to protect something of value to him. Some of these are one-way obstacles–you can walk through them but not back. The only thing that can smash these barriers is the wand, carried by the Revenants. It is not possible to win the game without passing through at least one of the barriers. When you are walking around and you suddenly hear a bump, you have walked into an invisible barrier.

There are multiple partitions on each floor, and you may have to go down, then come up again, or even go down again to get to them. It can get very confusing, and it is helpful to map the dungeon extensively in your travels. A friend can do this while you battle the monsters, or you can do it yourself.

Avoid the spirits at all cost! The Revenants can steal all your possessions with a single touch, even when you have the ring on. Sooner or later, however, you will have to kill one to get a wand. Do it wisely, by slashing and then moving back. If you stand toe to toe and slug it out he is sure to get your equipment before he expires.

When you get the crown and have brought all the objects on the command bar to the first floor, go to the original space you started in, under the ceiling exit you dropped down into the vault through, and USE the rope to win the game! Only when you have everything (all objects on the command bar lit in light red) can you exit and win the game.

There is a great deal more I could hint about, but I think half the fun of the game is solving the riddles in it and discovering the secret location of the crown. I leave the heavy exploration up to you. The game is seriously addictive, which I noted when I let several of my friends play it, and most of them yearned to break into the source listing and deduce the secrets of the *Vault*. For this reason I disabled the RUN STOP and RESTORE keys, as well as LIST, while the game is running.

I challenge you to win the game fairly. I think you will find it every bit as simultaneously frustrating and exhilarating as *Zork* itself! The save feature of the game allows you to set aside a game and come back to it, so you can play it for weeks before winning it, and I think even then you will return to the *Vault* for regular sojourns.

To use the load feature, hit f2 at the prompt on the title screen and enter the name of the file you wish to load. The filename must be 11 letters or less. If you hit RETURN with no input, the load will default to "LASTDUNGEON". The last game will be loaded, if you saved a game the last time you played. To save a game, go to the command bar at any time during the course of a game and hit f8. The current game will be saved to disk for you under the name "LASTDUNGEON". The reason the load feature asks you for the name of the file is that I plan to create new dungeon files if this game meets with reader approval. In that event, you will be able to enter the name of the new file to load in, instead of "LASTDUNGEON", and play a whole new version of the game with a new floorplan and new puzzles to solve! ☐ ***SEE PROGRAM LISTING ON PAGE 120***

PROGRAM LISTINGS

Attention new *Ahoy!* readers! You must read the following information very carefully prior to typing in programs listed in *Ahoy!* Certain Commodore characters, commands, and strings of characters and commands will appear in a special format. Follow the instructions and listing guide on this page.

On the following pages you'll find several programs that you can enter on your Commodore computer. But before doing so, read this entire page carefully.

To insure clear reproductions, *Ahoy!*'s program listings are generated on a daisy wheel printer, incapable of printing the commands and graphic characters used in Commodore programs. These are therefore represented by various codes enclosed in brackets [ ]. For example: the SHIFT CLR/HOME command is represented onscreen by a heart. The code we use in our listings is [CLEAR]. The chart below lists all such codes which you'll encounter in our listings, except for one other special case.

The other special case is the COMMODORE and SHIFT characters. On the front of most keys are two symbols. The symbol on the left is obtained by pressing that key while holding down the COMMODORE key; the symbol on the right, by pressing that key while holding down the SHIFT key. COMMODORE and SHIFT characters are represented in our listings by a lower-case "s" or "c" followed by the symbol of the key you must hit. COMMODORE J, for example, is represented by [c J], and SHIFT J by [s J].

Additionally, any character that occurs more than two times in a row will be displayed by a coded listing. For example, [3 "[LEFT]"] would be 3 CuRSoR left commands in a row, [5 "[s EP]"] would be 5 SHIFTed English Pounds, and so on. Multiple blank spaces will be noted in similar fashion: e.g., 22 spaces as [22 " "].

Sometimes you'll find a program line that's too long for the computer to accept (C-64 lines are a maximum of 80 characters, or 2 screen lines long; VIC 20 lines, a maximum of 88 characters, or 4 screen lines). To enter these lines, refer to the *BASIC Command Abbreviations Appendix* in your User Manual.

On the next page you'll find our *Bug Repellent* programs for the C-128 and C-64. The version appropriate for your machine will help you proofread our programs after you type them. (Please note: the *Bug Repellent* line codes that follow each program line, in the whited-out area, should *not* be typed in. See the instructions preceding each program.)

Also on the following page you will find *Flankspeed*, our ML entry program, and instructions on its use. ☐

Call *Ahoy!* at 212-239-0855 with any problems.

When You See	It Means	You Type	You Will See
[CLEAR]	Screen Clear	SHIFT CLR/HOME	
[HOME]	Home	CLR/HOME	
[UP]	Cursor Up	SHIFT ↑CRSR↓	
[DOWN]	Cursor Down	↑CRSR↓	
[LEFT]	Cursor Left	SHIFT ←CRSR→	
[RIGHT]	Cursor Right	←CRSR→	
[SS]	Shifted Space	SHIFT Space	
[INSERT]	Insert	SHIFT INST/DEL	
[DEL]	Delete	INST/DEL	
[RVSON]	Reverse On	CNTRL 9	
[RVSOFF]	Reverse Off	CNTRL 0	
[UPARROW]	Up Arrow	↑	
[BACKARROW]	Back Arrow	←	
[PI]	PI	π	
[EP]	English Pound	£	

When You See	It Means	You Type	You Will See
[BLACK]	Black	CNTRL 1	
[WHITE]	White	CNTRL 2	
[RED]	Red	CNTRL 3	
[CYAN]	Cyan	CNTRL 4	
[PURPLE]	Purple	CNTRL 5	
[GREEN]	Green	CNTRL 6	
[BLUE]	Blue	CNTRL 7	
[YELLOW]	Yellow	CNTRL 8	
[F1]	Function 1	F1	
[F2]	Function 2	SHIFT F1	
[F3]	Function 3	F3	
[F4]	Function 4	SHIFT F3	
[F5]	Function 5	F5	
[F6]	Function 6	SHIFT F5	
[F7]	Function 7	F7	
[F8]	Function 8	SHIFT F7	

BUG REPELLENT By MICHAEL KLEINERT and DAVID BARRON

Bug Repellent is a checksum program used for proofreading BASIC listings typed in from *Ahoy!* magazine. For each program line you enter, *Bug Repellent* will produce a two-letter code that should match the code listed beside that line in the magazine.

Type in, save, and run the *Bug Repellent.* (If you have a C-64, type in the C-64 version. If you have a C-128, you will need to type in the C-64 version for use with C-64 programs, and the C-128 version for use with C-128 programs.) If you have typed in *Bug Repellent* properly, you will get the message BUG REPELLENT INSTALLED; otherwise you will get an error message. If you get an error message, double check the *Bug Repellent* program for typing mistakes. Type NEW and hit RETURN. Then type in and save, or load, the *Ahoy!* program you wish to check. Type in SYS 49152 for the C-64 version or SYS 3072 for the C-128 version and hit RETURN (this will begin execution of *Bug Repellent*). You will see the prompt SCREEN OR PRINTER ? Hit S if you want the codes listed on the screen, or P if you want them listed on the printer. To pause the listing depress and hold the SHIFT key.

Compare the codes your machine generates to those listed to the right of the corresponding program lines. If you spot a difference, that line contains an error. Write down the numbers of the lines where the contradictions occur. LIST each line, locate the errors, and correct them.

COMMODORE 64 VERSION

```
·100 FOR X = 49152 TO 49488:READY:S=S+Y          AB
·110 IF Y<0 OR Y>255 THEN 130                    EA
·120 POKE X,Y:NEXT:GOTO140                       ID
·130 PRINT"[CLEAR][DOWN]**ERROR**":PRINT"[DOWN
 ]PLEASE CHECK LINE"PEEK(64)*256+PEEK(63):END    ID
·140 IF S<>44677 THEN PRINT"[CLEAR][DOWN]**ERR
 OR**":PRINT"[DOWN]PLEASE CHECK DATA LINES 170
 -500":END                                       HJ
·150 PRINT"[CLEAR]":POKE53280,0:POKE53281,6:PO
 KE646,1                                         NP
·160 PRINT"[RVSON][6" "]C-64 BUG REPELLENT INS
 TALLED[6" "]"                                   LF
·170 DATA32,161,192,165,43,133,251,165,44,133    DL
·180 DATA252,160,0,132,254,32,37,193,234,177     DB
·190 DATA251,208,3,76,138,192,230,251,208,2      OF
·200 DATA230,252,76,43,192,76,73,78,69,32        KN
·210 DATA35,32,0,169,35,160,192,32,30,171        CA
·220 DATA160,0,177,251,170,230,251,208,2,230     CE
·230 DATA252,177,251,32,205,189,169,58,32,210    JE
·240 DATA255,169,0,133,253,230,254,32,37,193     CL
·250 DATA234,165,253,160,0,76,13,193,133,253     NB
·260 DATA177,251,208,237,165,253,41,240,74,74    MB
·270 DATA74,74,24,105,65,32,210,255,165,253      EP
·280 DATA 41,15,24,105,65,32,210,255,169,13      GH
·290 DATA32,220,192,230,63,208,2,230,64,230      AN
·300 DATA251,208,2,230,252,76,11,192,169,153     NG
·310 DATA160,192,32,30,171,166,63,165,64,76      BF
·320 DATA231,192,96,76,73,78,69,83,58,32         EP
·330 DATA0,169,247,160,192,32,30,171,169,3       PJ
·340 DATA133,254,32,228,255,201,83,240,6,201     FK
·350 DATA80,208,245,230,254,32,210,255,169,4     FL
·360 DATA166,254,160,255,32,186,255,169,0,133    CL
·370 DATA63,133,64,133,2,32,189,255,32,192       GC
·380 DATA255,166,254,32,201,255,76,73,193,96     NN
·390 DATA32,210,255,173,141,2,41,1,208,249       NH
·400 DATA96,32,205,189,169,13,32,210,255,32      IM
·410 DATA204,255,169,4,76,195,255,147,83,67      KC
·420 DATA82,69,69,78,32,79,82,32,80,82           DC
·430 DATA 73,78,84,69,82,32,63,32,0,76           ML
·440 DATA44,193,234,177,251,201,32,240,6,138     GN
·450 DATA113,251,69,254,170,138,76,88,192,0      JK
·460 DATA0,0,0,230,251,208,2,230,252,96          NA
·470 DATA170,177,251,201,34,208,6,165,2,73       DM
·480 DATA255,133,2,165,2,208,218,177,251,201     JA
·490 DATA32,208,212,198,254,76,29,193,0,169      FM
·500 DATA13,76,210,255,0,0,0                     PA
```

COMMODORE 128 VERSION

```
·100 FAST:FOR X = 3072 TO 3520:READ Y:POKE X,Y
 :S=S+Y:TRAP110:NEXT:SLOW                        IH
·110 SLOW:IF S<>49057 THEN PRINT"[CLEAR][DOWN]
 **ERROR**":PRINT"[DOWN]PLEASE CHECK DATA LINE
 S 140-390":END                                  JA
·120 PRINT"[CLEAR][DOWN]  C-128 BUG REPELLENT
 INSTALLED"                                      II
·130 PRINT"[4" "]TYPE SYS 3072 TO ACTIVATE"      IN
·140 DATA 32,161,12,165,45,133,251,165,46,133,
 252,160,0,132,254,32,37                         OF
·150 DATA 13,234,177,251,208,3,76,138,12,230,2
 51,208,2,230,252,76,43                          NC
·160 DATA 12,76,73,78,69,32,35,32,0,169,35,160
 ,12,32,80,13,160,0,177                          OL
·170 DATA 251,170,230,251,208,2,230,252,177,25
 1,32,89,13,169,58,32,98                         EF
·180 DATA 13,169,0,133,253,230,254,32,37,13,23
 4,165,253,160,0,76,13                           JO
·190 DATA 13,133,253,177,251,208,237,165,253,4
 1,240,74,74,74,74,24                            LC
·200 DATA 105,65,32,98,13,165,253,41,15,24,105
 ,65,32,98,13,169,13,32                          DE
·210 DATA 220,12,230,65,208,2,230,66,230,251,2
 08,2,230,252,76,11,12                           GM
·220 DATA 169,153,160,12,32,80,13,166,65,165,6
 6,76,231,12,96,76,73,78                         CP
·230 DATA 69,83,58,32,0,169,247,160,12,32,80,1
 3,169,3,133,254,32,107                          HC
·240 DATA 13,201,83,240,6,201,80,208,245,230,2
 54,32,98,13,169,4,166                           GK
·250 DATA 254,160,255,32,116,13,169,0,133,65,1
 33,66,133,250,32,125,13                         LB
·260 DATA 32,134,13,166,254,32,143,13,76,73,13
 ,96,32,98,13,165,211                            JF
·270 DATA 234,41,1,208,249,96,32,89,13,169,13,
 32,98,13,32,152,13,169,4                        GD
·280 DATA 76,161,13,147,83,67,82,69,69,78,32,7
 9,82,32,80,82,73,78,84,69                       PL
·290 DATA 82,32,63,32,0,76,44,13,234,177,251,2
 01,32,240,6,138,113,251,69                      OK
·300 DATA 254,170,138,76,88,12,0,0,0,0,230,251
 ,208,2,230,252,96,170,177                       FJ
·310 DATA 251,201,34,208,6,165,250,73,255,133,
 250,165,250,208,218,177                         GA
·320 DATA 251,201,32,208,212,198,254,76,29,13,
 0,169,13,76,98,13,0,0,32                        FI
·330 DATA 170,13,32,226,85,76,180,13,32,170,13
 ,32,50,142,76,180,13,32                         OF
·340 DATA 170,13,32,210,255,76,180,13,32,170,1
 3,32,228,255,76,180,13,32                       AK
·350 DATA 170,13,32,186,255,76,180,13,32,170,1
 3,32,189,255                                    BP
·360 DATA 76,180,13,32,170,13,32,192,255,76,18
 0,13,32,170,13                                  FP
·370 DATA 32,201,255,76,180,13,32,170,13,32,20
 4,255,76,180,13,32,170                          ID
·380 DATA 13,32,195,255,76,180,13,133,67,169,0
 ,141,0,255,165,67,96                            BJ
·390 DATA 133,67,169,0,141,1,255,165,67,96,0,0
 ,0                                              IF
```

FLANKSPEED FOR THE C-64 By GORDON F. WHEAT

Flankspeed will allow you to enter machine language *Ahoy!* programs without any mistakes. Once you have typed the program in, save it for future use. While entering an ML program with *Flankspeed* there is no need to enter spaces or hit the carriage return. This is all done automatically. If you make an error in a line a bell will ring and you will be asked to enter it again. To LOAD in a program Saved with *Flankspeed* use LOAD "name",1,1 for tape, or LOAD "name",8,1 for disk. The function keys may be used after the starting and ending addresses have been entered.

f1 – SAVEs what you have entered so far.

f3 – LOADs in a program worked on previously.

f5 – To continue on a line you stopped on after LOADing in the previous saved work.

f7 – Scans through the program to locate a particular line, or to find out where you stopped the last time you entered the program. f7 temporarily freezes the output as well.

```
·100 POKE53280,12:POKE53281,11                                LL
·105 PRINT"[CLEAR][c 8][RVSON][15" "]FLANKSPEED[15" "]";      ED
·110 PRINT"[RVSON][5" "]MISTAKEPROOF ML ENTRY PROGRAM[6" "
]"                                                            MC
·115 PRINT"[RVSON][9" "]CREATED BY G. F. WHEAT[9" "]"         DM
·120 PRINT"[RVSON][3" "]COPR. 1984, ION INTERNATIONAL INC.
[3" "]"                                                       DH
·125 FORA=54272TO54296:POKEA,0:NEXT                           IM
·130 POKE54272,4:POKE54273,48:POKE54277,0:POKE54278,249:PO
KE54296,15                                                    NH
·135 FORA=680TO699:READB:POKEA,B:NEXT                         KO
·140 DATA169,251,166,253,164,254,32,216,255,96                HJ
·145 DATA169,0,166,251,164,252,32,213,255,96                  JB
·150 B$="STARTING ADDRESS IN HEX":GOSUB430:AD=B:SR=B          KA
·155 GOSUB480:IFB=0THEN150                                    GN
·160 POKE251,T(4)+T(3)*16:POKE252,T(2)+T(1)*16                KE
·165 B$="ENDING ADDRESS IN HEX":GOSUB430:EN=B                 LO
·170 GOSUB470:IFB=0THEN150                                    EE
·175 POKE254,T(2)+T(1)*16:B=T(4)+1+T(3)*16                    MN
·180 IFB>255THENB=B-255:POKE254,PEEK(254)+1                   GE
·185 POKE253,B:PRINT                                          HN
·190 REM  GET HEX LINE                                        IL
·195 GOSUB495:PRINT": [c P][LEFT]";:FORA=0TO8                 NH
·200 FORB=0TO1:GOTO250                                        MP
·205 NEXTB                                                    ME
·210 A%(A)=T(1)+T(0)*16:IFAD+A-1=ENTHEN340                    LE
·215 PRINT" [c P][LEFT]";                                     IK
·220 NEXTA:T=AD-(INT(AD/256)*256):PRINT" "                    PD
·225 FORA=0TO7:T=T+A%(A):IFT>255THENT=T-255                   LK
·230 NEXT                                                     IA
·235 IFA%(8)<>TTHENGOSUB375:GOTO195                           LE
·240 FORA=0TO7:POKEAD+A,A%(A):NEXT:AD=AD+8:GOTO195            BI
·245 REM    GET HEX INPUT                                     AB
·250 GETA$:IFA$=""THEN250                                     HK
·255 IFA$=CHR$(20)THEN305                                     HF
·260 IFA$=CHR$(133)THEN535                                    KH
·265 IFA$=CHR$(134)THEN560                                    JM
·270 IFA$=CHR$(135)THENPRINT" ":GOTO620                       EG
·275 IFA$=CHR$(136)THENPRINT" ":GOTO635                       AB
·280 IFA$>"@"ANDA$<"G"THENT(B)=ASC(A$)-55:GOTO295             DL
·285 IFA$>"/"ANDA$<":"THENT(B)=ASC(A$)-48:GOTO295             MD
·290 GOSUB415:GOTO250                                         JJ
·295 PRINTA$"[c P][LEFT]";                                    OA
·300 GOTO205                                                  CF
·305 IFA>0THEN320                                             PG
·310 A=-1:IFB=1THEN330                                        OI
·315 GOTO220                                                  BM
·320 IFB=0THENPRINTCHR$(20);CHR$(20);:A=A-1                   HG
·325 A=A-1                                                    BE
·330 PRINTCHR$(20);:GOTO220                                   LK
·335 REM LAST LINE                                            AD
·340 PRINT" ":T=AD-(INT(AD/256)*256)                          GJ
·345 FORB=0TOA-1:T=T+A%(B):IFT>255THENT=T-255                 PL
·350 NEXT                                                     IA
·355 IFA%(A)<>TTHENGOSUB375:GOTO195                           NF
·360 FORB=0TOA-1:POKEAD+B,A%(B):NEXT                          HN
·365 PRINT:PRINT"YOU ARE FINISHED!":GOTO535                   JA
·370 REM BELL AND ERROR MESSAGES                              FL
·375 PRINT:PRINT"LINE ENTERED INCORRECTLY":PRINT:GOTO415      DA
·380 PRINT:PRINT"INPUT A 4 DIGIT HEX VALUE!":GOTO415          FF
·385 PRINT:PRINT"ENDING IS LESS THAN STARTING!":B=0:GOTO41
5                                                             HD
·390 PRINT:PRINT"ADDRESS NOT WITHIN SPECIFIED RANGE!":B=0:
GOTO415                                                       OK
·395 PRINT:PRINT"NOT ZERO PAGE OR ROM!":B=0:GOTO415           FN
·400 PRINT"?ERROR IN SAVE":GOTO415                            PP
·405 PRINT"?ERROR IN LOAD":GOTO415                            PO
·410 PRINT:PRINT:PRINT"END OF ML AREA":PRINT                  PG
·415 POKE54276,17:POKE54276,16:RETURN                         BH
·420 OPEN15,8,15:INPUT#15,A,A$:CLOSE15:PRINTA$:RETURN         IM
·425 REM GET FOUR DIGIT HEX                                   PC
·430 PRINT:PRINTB$;:INPUTT$                                   GM
·435 IFLEN(T$)<>4THENGOSUB380:GOTO430                         NP
·440 FORA=1TO4:A$=MID$(T$,A,1):GOSUB450:IFT(A)=16THENGOSUB
380:GOTO430                                                   FJ
·445 NEXT:B=(T(1)*4096)+(T(2)*256)+(T(3)*16)+T(4):RETURN      GF
·450 IFA$>"@"ANDA$<"G"THENT(A)=ASC(A$)-55:RETURN              EH
·455 IFA$>"/"ANDA$<":"THENT(A)=ASC(A$)-48:RETURN              KP
·460 T(A)=16:RETURN                                           NP
·465 REM ADRESS CHECK                                         LI
·470 IFAD>ENTHEN385                                           LB
·475 IFB<SRORB>ENTHEN390                                      KC
·480 IFB<256OR(B>40960ANDB<49152)ORB>53247THEN395             MG
·485 RETURN                                                   IM
·490 REM ADDRESS TO HEX                                       EB
·495 AC=AD:A=4096:GOSUB520                                    FD
·500 A=256:GOSUB520                                           PE
·505 A=16:GOSUB520                                            MI
·510 A=1:GOSUB520                                             IL
·515 RETURN                                                   IM
·520 T=INT(AC/A):IFT>9THENA$=CHR$(T+55):GOTO530               PE
·525 A$=CHR$(T+48)                                            JP
·530 PRINTA$;:AC=AC-A*T:RETURN                                AC
·535 A$="**SAVE**":GOSUB585                                   LH
·540 OPEN1,T,1,A$:SYS680:CLOSE1                               LH
·545 IFST=0THENEND                                            EO
·550 GOSUB400:IFT=8THENGOSUB420                               CM
·555 GOTO535                                                  CL
·560 A$="**LOAD**":GOSUB585                                   NE
·565 OPEN1,T,0,A$:SYS690:CLOSE1                               MF
·570 IFST=64THEN195                                           LC
·575 GOSUB405:IFT=8THENGOSUB420                               AN
·580 GOTO560                                                  CL
·585 PRINT" ":PRINTTAB(14)A$                                  FG
·590 PRINT:A$="":INPUT"FILENAME";A$                           OM
·595 IFA$=""THEN590                                           DD
·600 PRINT:PRINT"TAPE OR DISK?":PRINT                         DF
·605 GETB$:T=1:IFB$="D"THENT=8:A$="@0:"+A$:RETURN             IG
·610 IFB$<>"T"THEN605                                         BO
·615 RETURN                                                   IM
·620 B$="CONTINUE FROM ADDRESS":GOSUB430:AD=B                 OH
·625 GOSUB475:IFB=0THEN620                                    GH
·630 PRINT:GOTO195                                            PH
·635 B$="BEGIN SCAN AT ADDRESS":GOSUB430:AD=B                 FA
·640 GOSUB475:IFB=0THEN635                                    IB
·645 PRINT:GOTO670                                            PP
·650 FORB=0TO7:AC=PEEK(AD+B):GOSUB505:IFAD+B=ENTHENAD=SR:G
OSUB410:GOTO195                                               NK
·655 PRINT" ";:NEXTB                                          EC
·660 PRINT:AD=AD+8                                            GN
·665 GETB$:IFB$=CHR$(136)THEN195                              LI
·670 GOSUB495:PRINT": ";:GOTO650                              IB
```

THE FASTEST DRAW IN THE INDUSTRY

FROM PAGE 27

Assembler required for program entry! See introductory article.

RECTANGLE.S

```
*
* RECTANGLE.S
*
         ORG    $1300
*
TEMPA    EQU    $FA
TEMPB    EQU    TEMPA+2
*
TABPTR   EQU    TEMPA
*
COLOR    EQU    $10
BMFLG    EQU    $D8
BMPTR    EQU    $A2D
COLMAP   EQU    $1C00
SCROLY   EQU    $D011
*
HMAX     EQU    320
*
SCRBAS   EQU    $2000
PTRL     EQU    $8000
PTRH     EQU    $8100
*
MAPLEN   EQU    1000
SCRLEN   EQU    8000
*
HSTART   EQU    $0C00
HEND     EQU    $0C02
VSTART   EQU    $0C04
VEND     EQU    $0C05
*
TABSIZ   EQU    VEND+1
HPSN     EQU    TABSIZ+2
VPSN     EQU    HPSN+2
CHAR     EQU    VPSN+1
ROW      EQU    CHAR+1
LINE     EQU    ROW+1
BYTE     EQU    LINE+1
BITT     EQU    BYTE+2
*
MPRL     EQU    BITT+1
MPRH     EQU    MPRL+1
MPDL     EQU    MPRH+1
MPDH     EQU    MPDL+1
PRODL    EQU    MPDH+1
PRODH    EQU    PRODL+1
*
FILVAL   EQU    PRODH+1
HPOS     EQU    FILVAL+1
*
         JMP    START
*
BITPSN   HEX    80,40,20,10
         HEX    08,04,02,01
* BLOCK FILL ROUTINE
*
BLKFIL   LDA    FILVAL
         LDX    TABSIZ+1
         BEQ    PARTPG
         LDY    #0
FULLPG   STA    (TABPTR),Y
         INY
         BNE    FULLPG
         INC    TABPTR+1
         DEX
         BNE    FULLPG
PARTPG   LDX    TABSIZ
         BEQ    FINI
         LDY    #0
PARTLP   STA    (TABPTR),Y
         INY
         DEX
         BNE    PARTLP
FINI     RTS
*
* 16-BIT MULTIPLICATION
*
MULT16   LDA    #0
         STA    PRODL
         STA    PRODH
         LDX    #16
SHIFT    ASL    PRODL
         ROL    PRODH
         ASL    MPRL
         ROL    MPRH
         BCC    NOADD
         CLC
         LDA    MPDL
         ADC    PRODL
         STA    PRODL
         LDA    MPDH
         ADC    PRODH
         STA    PRODH
NOADD    DEX
         BNE    SHIFT
         RTS
*
* CREATE Y-LOOKUP TABLE
*
MAKTAB   LDY    #0
YLOOP    CPY    #200
         BCC    CONT
         JMP    EXIT
*
* DIVIDE Y BY 8
*
CONT     TYA
         LSR    A
         LSR    A
         LSR    A
         STA    ROW
*
* MULTIPLY ROW * HMAX
*
         LDA    ROW
         STA    MPRL
         LDA    #0
         STA    MPRH
         LDA    #<HMAX
         STA    MPDL
         LDA    #>HMAX
         STA    MPDH
         JSR    MULT16
         LDA    PRODL
         STA    TEMPA
         LDA    PRODH
         STA    TEMPA+1
*
* ADD PRODUCT TO SCRBAS
*
         CLC
         LDA    #<SCRBAS
         ADC    TEMPA
         STA    PTRL,Y
         LDA    #>SCRBAS
         ADC    TEMPA+1
         STA    PTRH,Y
*
         INY
         JMP    YLOOP
*
EXIT     RTS
*
* MAIN ROUTINE
*
* DEFINE BIT MAP AND
* ENABLE HI-RES GRAPHICS
*
START    JSR    MAKTAB
*
         STA    $FF01
         LDA    #$78
         STA    BMPTR
*
         LDA    #$20
         STA    BMFLG
*
         LDA    #0
         STA    $FF00
         LDA    SCROLY
         ORA    #$20
         STA    SCROLY
         STA    $FF01
*
* CLEAR BIT MAP
*
         LDA    #0
```

IMPORTANT! Letters on white background are **Bug Repellent** line codes. **Do not enter them!** Pages 101 and 102 explain these codes and provide other essential information on entering ***Ahoy!*** programs. Refer to these pages **before** entering any programs!

```
         STA   FILVAL
         LDA   #<SCRBAS
         STA   TABPTR
         LDA   #>SCRBAS
         STA   TABPTR+1
         LDA   #<SCRLEN
         STA   TABSIZ
         LDA   #>SCRLEN
         STA   TABSIZ+1
         JSR   BLKFIL
*
* SET BKG AND LINE COLORS
*
         LDA   #COLOR
         STA   FILVAL
         LDA   #<COLMAP
         STA   TABPTR
         LDA   #>COLMAP
         STA   TABPTR+1
         LDA   #<MAPLEN
         STA   TABSIZ
         LDA   #>MAPLEN
         STA   TABSIZ+1
         JSR   BLKFIL
*
* DRAW HORIZONTAL LINES
*
         LDA   VSTART
         STA   VPSN
         LDA   HSTART
         STA   HPSN
         LDA   HSTART+1
         STA   HPSN+1
         JSR   HDRAW
*
         LDA   VEND
         STA   VPSN
         LDA   HSTART
         STA   HPSN
         LDA   HSTART+1
         STA   HPSN+1
         JSR   HDRAW
*
* DRAW VERTICAL LINES
*
         LDA   VSTART
         STA   VPSN
         LDA   HSTART
         STA   HPOS
         LDA   HSTART+1
         STA   HPOS+1
         JSR   VDRAW
*
         LDA   VSTART
         STA   VPSN
         LDA   HEND
         STA   HPOS
         LDA   HEND+1
         STA   HPOS+1
         JSR   VDRAW
*
INF      JMP   INF
*
HDRAW    JSR   PLOT
         INC   HPSN
         BNE   NEXT
         INC   HPSN+1
NEXT     LDA   HPSN+1
         CMP   HEND+1
         BCC   HDRAW
         LDA   HPSN
         CMP   HEND
         BCC   HDRAW
         RTS
*
VDRAW    LDA   HPOS
         STA   HPSN
         LDA   HPOS+1
         STA   HPSN+1
         JSR   PLOT
         INC   HPSN
         BNE   SKIP
         INC   HPSN+1
SKIP     JSR   PLOT
         LDX   VPSN
         INX
         STX   VPSN
         CPX   VEND
         BCC   VDRAW
         RTS
*
* CHAR=HPSN/8
*
PLOT     LDA   HPSN
         LSR   HPSN+1
         ROR
         LSR   HPSN+1
         ROR
         LSR   HPSN+1
         ROR
         STA   CHAR
*
* MULTIPLY 8 * CHAR
*
         LDA   #0
         ASL   CHAR
         ROL
         ASL   CHAR
         ROL
         ASL   CHAR
         ROL
         STA   TEMPB+1
*
* ADD LINE
*
         CLC
         LDA   VPSN
         AND   #7
         ADC   CHAR
         STA   TEMPB
         LDA   TEMPB+1
         ADC   #0
         STA   TEMPB+1
*
* BYTE = TEMPA + TEMPB
*
         CLC
         LDY   VPSN
         LDA   PTRL,Y
         ADC   TEMPB
         STA   TEMPB
         LDA   PTRH,Y
         ADC   TEMPB+1
         STA   TEMPB+1
*
* BYTE=BYTE OR 2^BIT
*
         LDA   HPSN
         AND   #$07
         TAX
         LDY   #0
         LDA   (TEMPB),Y
         ORA   BITPSN,X
         STA   (TEMPB),Y
         RTS
*
```

RECTANGLE.BAS

```
•10 REM *** RECTANGLE.BAS ***                    BD
•20 :                                            DI
•30 HST = 105                                    EO
•40 HND = 211                                    CH
•50 VST = 66                                     CB
•60 VND = 132                                    EF
•70 :                                            DI
•80 IF A=0 THEN A=1:BLOAD "RECTANGLE.O"          BO
•90 HI=INT(HST/256):LO=HST-HI*256                KM
•100 POKE DEC("0C00"),LO:POKE DEC("0C01")
 ,HI                                             DO
•110 HI=INT(HND/256):LO=HND-HI*256               KK
•120 POKE DEC("0C02"),LO:POKE DEC("0C03")
```

IMPORTANT! Letters on white background are **Bug Repellent** line codes. **Do not enter them!** Pages 101 and 102 explain these codes and provide other essential information on entering ***Ahoy!*** programs. Refer to these pages **before** entering any programs!

```
 ,HI                                          OC
•130 POKE DEC("0C04"),VST:POKE DEC("0C05"
 ),VND                                        NO
•140 SYS DEC("1300")                          NG
```

ANALOG TO DIGITAL ADVENTURES
FROM PAGE 20

DIGITAL SCOPE

```
•1 REM                                        JD
•2 REM        -- DIGITAL SCOPE --             OL
•3 REM      PROGRAM FOR THE C-128             IJ
•4 REM         RUPERT REPORT #34              OK
•5 REM                                        JD
•6 REM  *-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*       CD
•7 REM   USE A/D CONVERTER TO CREATE          CI
•8 REM     A DIGITAL OSCILLOSCOPE             GN
•9 REM  KEYS:                                 BJ
•10 REM  <CRSR UP> - SHIFT DISPLAY UP         JB
•11 REM  <CRSR DN> - SHIFT DISPLAY DOWN       OA
•12 REM  "+" - MAGNIFY DISPLAY                HH
•13 REM  "-" - DEMAGNIFY DISPLAY              NH
•14 REM  "C" - CLEAR DISPLAY                  LK
•15 REM  "P" - PAUSE DISPLAY                  PK
•16 REM        (ANY KEY TO RESTART)           GN
•17 REM  "Z" - REINITIALIZE PARAMETERS        CI
•18 REM *-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*       CD
•19 REM                                       JD
•20 TRAP 1000                                 JM
•25 REM >=>=>=>=>=> DEFINE CONSTANTS >=>      CJ
•30 D$="V" : U$="[UPARROW]"                   NL
•40 MAX=10       :REM  RUNNING AVERAGE QTY.   EC
•50 PN=1         :REM  POT NUMBER             AD
•60 REM >=>=>=>=>=>  INITIALIZATION >=>       KB
•70 GRAPHIC 1,1                               GP
•80 G=190/255 :REM  GAIN (MAGNIFICATION)      FM
•90 VY=5        :REM  VERTICAL OFFSET         FJ
•100 PRINT POT(PN)*G+VY,     :REM  INITIAL
 Y SCREEN VALUE                               LI
•110 REM >=>=>=>=>=>=>=>=> MAIN LOOP >=>      ID
•120 FOR X=1 TO 320                           PC
•130 Y=200-(POT(PN)*G+VY)                     JO
•140 DRAW ,X,Y                                PE
•150 REM >=>=>=>=>=> RUNNING AVERAGE >=>      FL
•160 PTR=PTR+1 : IF PTR>MAX THEN PTR=0        OB
•170 SUM=SUM-YV(PTR)+Y                        CE
•180 YV(PTR)=Y         :REM  REPLACE OLDEST
 Y VALUE WITH NEWEST                          MO
•190 AVG=SUM/MAX        :REM  CALC. AVERAGE   CB
•200 DRAW ,X,AVG-50    :REM  PLOT IT          GI
•210 REM -=-=- LOCATE OFFSCREEN IMAGE -=-     PD
•220 IF Y<200 AND Y>0 THEN CHAR ,1,24," "
 : CHAR ,1,0," " : GOTO 240                   AH
•230 IF Y>200 THEN CHAR ,1,24,D$ :ELSE IF
 Y<0 THEN CHAR ,1,0,U$                        DN
•240 GET A$ : IF A$>"" THEN 290               JN
•250 NEXT X                                   NK
•260 GRAPHIC 1,1        :REM  CLEAR SCREEN    DE
•270 GOTO 120           :REM  START AGAIN     OA
•280 REM >=>=>=>=>=>=>=> KEY PRESSED >=>      MI
•290 K=INSTR("[UP][DOWN]+-CPZ",A$)            AL
•300 IF K=0 THEN 250    :REM INVALID KEY      NI
•310 ON K GOSUB 330,340,350,360,370,380,3
 90                                           KE
•320 ON K GOTO 250,250,250,250,120,250,70     CA
•330 VY=VY+5 : RETURN   :REM CURSOR UP        NM
•340 VY=VY-5 : RETURN   :REM CURSOR DOWN      KD
•350 G=G*1.1 : RETURN   :REM  +(GAIN UP)      BI
•360 G=G*.9 : RETURN    :REM -(GAIN DOWN)     AF
•370 GRAPHIC 1,1 :RETURN :REM C (CLEAR)       MP
•380 GETKEY Q$ : RETURN  :REM P (PAUSE)       PG
•390 RETURN          :REM  Z (ZERO/RESTART)   HI
•1000 IF ER=30 THEN END  :REM RUN/STOP        JD
•1010 RESUME NEXT                             FI
```

ATTACK FORCE
FROM PAGE 72

```
•10 POKE52,55:POKE56,55:CLR:GOTO800           OO
•20 POKEOO,1:POKEPS,0:POKEHT,0:POKETH,0:F
C=0:TC=10:LC=18:CC=12:Y=25                    KJ
•30 GOTO100                                   CF
•50 GOSUB660                                  CI
•55 PRINT"[HOME][YELLOW] AGAIN[3"."]":SYS
SR:SYSSR                                      HM
•60 PRINT"[HOME] YOUR PEOPLE ARE FREE ONC
E":SYSSR:SYSSR:SYSSR:SYSSR                    KD
•65 PRINT"[HOME][RED] OF THE ENEMY INSTAL
LATIONS.":SYSSR:SYSSR                         DH
•70 PRINT"[HOME] YOU HAVE DESTROYED ALL":
SYSSR:SYSSR                                   BF
•75 FORI=1TO6:SYSSR:NEXT:POKES+5,128:POKE
S+6,248:POKES+12,0:POKES+13,240               MC
•80 P(0)=34:P(1)=34:P(2)=45:D(0)=200:D(1)
=100:D(2)=450                                 OB
•85 FORI=0TO2:POKES+1,P(I):POKES+8,P(I)-1
5:POKES,0:POKES+7,0                           JH
•86 POKES+4,17:POKES+11,17                    CP
•90 FORD=1TOD(I):NEXT:POKES+4,16:POKES+11
,16:FORJ=1TO25:NEXT:NEXT                      CK
•95 SYSXY,7,23:PRINT"[BLUE]PRESS ANY KEY"
:POKE198,0                                    FP
•98 GETA$:IFA$=""THEN98                       GC
•99 MS=9:GOTO700                              AD
•100 IFPEEK(PS)THEN200                        IK
•110 IFPEEK(TH)THENGOSUB400                   BF
•115 IFPEEK(HT)THENGOSUB450                   AE
•120 IFINT(RND(1)*30)=1ANDBS=0THENGOSUB46
0                                             IL
•130 IFBS=1THENGOSUB470                       NA
```

```
·140 FC=FC+1:IFFC=40+MS*2THENFC=0:GOTO325 LE
·150 IFPEEK(653)AND1THEN190 GF
·180 GOSUB300 CD
·185 GOTO100 CF
·190 IFPEEK(653)THENPOKEOO,0:POKES+24,0:G
OTO190 LN
·195 POKEOO,1:POKES+24,47:GOTO180 ME
·200 POKE2040,253:POKES+1,8:POKES+5,0:POK
ES+6,13:POKES+4,129:POKES+4,128 FO
·205 POKES+11,0:POKES+18,0 BM
·210 POKEV+28,PEEK(V+28)OR1:FORI=1TO100:P
OKEV+39,8:POKEV+39,2:NEXT MB
·215 BS=0:SYSXY,32,21:PRINT"[5" "]" NJ
·220 FORI=1TO1500:NEXT:SH=SH-1:IFSH=-1THE
N250 NB
·225 SYSXY,31,14:PRINT"[BLUE]"SH:POKEV+21
,192:FC=0:GOTO500 EG
·250 POKEOO,0:POKES+4,0:POKES+11,0:POKES+
18,0:POKEV+21,192 PK
·255 SYSXY,7,10:PRINT"[YELLOW]][11"[UPARR
OW]"]?" KE
·260 PRINTTAB(7)"[ [WHITE]GAME OVER[YELLO
W] @" PK
·265 PRINTTAB(7)"[EP][11"[UPARROW]"][BACK
ARROW]" KO
·270 FORI=1TO3000:NEXT:POKEV+21,0:GOTO700 OJ
·300 SYSSR:Y=Y+1:IFY=35-MSTHENY=0:GOSUB34
0 BA
·305 TC=TC+1:IFTC=35-MSTHENTC=0:GOSUB350 AI
·310 CC=CC+1:IFCC=35-MSTHENCC=0:GOSUB380 JJ
·315 LC=LC+1:IFLC=35-MSTHENLC=0:GOSUB390 CE
·320 RETURN IM
·325 F=F-1:IFF=0THEN200 EE
·330 SYSXY,30,17:PRINT"[9" "]" JE
·335 SYSXY,30,17:PRINTLEFT$(F$,F*2):GOTO1
80 CO
·340 SYSXY,0,0:POKE646,RND(1)*6+10:PRINTW
L$(RND(1)*9+1):RETURN BJ
·350 POKEV+6,RND(1)*220+30:POKEV+7,28:POK
EV+21,PEEK(V+21)OR8:POKETH,0 JK
·352 POKE2043,251:POKEV+42,11:RETURN MI
·380 POKEV+4,RND(1)*220+30:POKEV+5,28:POK
EV+21,PEEK(V+21)OR4:POKEHT,0 KC
·385 POKE2042,252:POKEV+41,8:RETURN HF
·390 SYSXY,0,0:PRINTLZ$(RND(1)*8+1):RETUR
N CK
·400 IFPEEK(2043)=253THENRETURN AM
·405 POKEV+42,2:POKE2043,253 AH
·410 SC=SC+250:GOSUB680 IA
·415 T=T+1:IFT=MS+4THEN570 OH
·420 RETURN IM
·450 IFPEEK(2042)=253THENRETURN PF
·455 POKEV+41,2:POKE2042,253 BB
·458 SC=SC+10+10*MS:GOSUB680:RETURN HJ
·460 BS=1:BF=150:POKES+12,0:POKES+13,240:
POKES+8,BF HD
·465 X=INT(RND(1)*26)+1:XX=INT(X/6)+1 KI
·466 SYSXY,XX+31,21:PRINT"[RED].":POKES+1
1,17 MB
·468 RETURN IM
·470 BF=BF-5:POKES+8,BF:IFBF>90THENRETURN CN
·475 Z=INT(PEEK(V+1)/8):SYSXY,X,Z-7:PRINT
"[RED][3"&"][UP][LEFT][LEFT]&[DOWN][DOWN
][LEFT]&":POKES+11,16:BS=0 MK
·480 SYSXY,32,21:PRINT"[5" "]" BJ
·485 POKES+11,16:POKES+8,8:POKES+12,0:POK
ES+13,11:POKES+11,129:POKES+11,128 FE
·490 RETURN IM
·500 POKEV+21,192:GOSUB660:POKE2040,255:P
OKE2041,254:POKE2042,252:POKE2043,251 FJ
·505 POKE V,124:POKEV+1,210:POKEV+39,6:PO
KEV+40,2:SYSXY,31,11:PRINT"[BLUE]"MS BO
·510 POKEV+41,8:POKEV+42,11:POKEV+28,12:P
OKEV+37,7:POKEV+38,12 LK
·515 POKE53270,PEEK(53270)OR16:POKE53282,
1 BC
·520 POKEV+23,0:POKEV+29,0:POKEV+21,193 DH
·522 POKES+23,244:POKES+22,0:POKES+24,47:
POKES+19,208:POKES+20,240 EO
·524 POKES+14,0:POKES+15,6:POKES+18,129 DE
·525 SYSXY,3,11:PRINT"[RED]PREPARE FOR MI
SSION"MS CE
·528 SYSXY,5,13:PRINT"DESTROY"MS+4-T"TOWE
R";:IFMS+4-T>1THENPRINT"S" GE
·530 POKES+5,0:POKES+6,240:POKES+4,33:FOR
I=1TO3 FJ
·535 POKES+1,8:POKES,97:FORJ=1TO350:NEXT:
POKES+1,12:POKES,32:FORJ=1TO350:NEXT GL
·540 NEXT:POKES+4,32 AL
·545 GOSUB660:TC=0:Y=0 GB
·550 OO=53245:SS=52992:TS=52993:PS=52994:
HT=52995:TH=52996:SR=50432 AF
·555 POKES+5,0:POKES+6,9 IK
·560 F$="[RED]'[GREEN]'[GREEN]'[GREEN]'[G
REEN]'[GREEN]'[GREEN]'[GREEN]'[GREEN]'":
SYSXY,30,17:PRINTF$:F=9 CG
·565 Z=PEEK(V+30):Z=PEEK(V+31):GOTO20 FB
·570 POKEV+21,192:POKES+4,0:POKES+11,0:PO
KES+18,0:GOSUB660 PA
·575 SYSXY,4,11:PRINT"[WHITE]MISSION"MS"C
OMPLETED":POKEOO,0 KB
·580 FORI=1TO500:NEXT:MS=MS+1:IFMS=10THEN
50 EC
·585 SYSXY,7,13:PRINT"[YELLOW]BONUS:"F*10
"PTS.":GOSUB680 MH
·590 FORI=1TO2500:NEXT:T=0:GOTO500 CL
·600 FORI=1093TO1973STEP40:POKEI,27:POKEI
+10,0:NEXT NN
·610 XY=832:SYSXY,29,0:PRINT"[WHITE]][9"[
UPARROW]"]?" EG
·615 SYSXY,29,24:PRINT"[EP][9"[UPARROW]"]
";:POKE2023,31 EA
·620 FORI=3TO18STEP3:SYSXY,30,I:PRINT"[9"
[UPARROW]"]":NEXT EI
·625 SYSXY,31,4:PRINT"[CYAN]SCORE":SYSXY,
31,7:PRINT"HIGH":SYSXY,31,10:PRINT"MISSI
```

```
ON"                                         KE
•630 SYSXY,31,13:PRINT"SHIPS":SYSXY,31,16
:PRINT"FUEL"                                KB
•632 PRINTTAB(30)"[RED]'[GREEN][8"'"][CYA
N]"                                         BB
•635 SYSXY,31,19:PRINT"SCANNER":PRINTTAB(
31)"[BLUE]][5"[UPARROW]"]?"                 FE
•640 PRINTTAB(31)"[[5" "]@":PRINTTAB(31)"
[  [BLUE]*[BLUE]  @"                        BA
•650 PRINTTAB(31)"[EP][5"[UPARROW]"][BACK
ARROW]"                                     LG
•655 RETURN                                 IM
•660 FORI=0TO12:SYSXY,0,I:PRINT"[29" "]"    CA
•670 SYSXY,0,24-I:PRINT"[29" "]";:NEXT:RE
TURN                                        FF
•680 SYSXY,31,5:PRINT"[BLUE][8" "]":SYSXY
,31,5:PRINTSC                               BI
•685 IFSC>HSTHENHS=SC:SYSXY,31,8:PRINT"[8
" "]":SYSXY,31,8:PRINTHS                    MO
•690 RETURN                                 IM
•700 POKE53281,0:POKE53280,11:POKEV+28,0:
POKE53270,PEEK(53270)AND239                 LD
•705 POKEV+23,1:POKEV+29,1:POKEV+16,192:P
OKEV+12,25:POKEV+14,49                      EL
•710 POKEV+13,57:POKEV+15,57:POKE2046,249
:POKE2047,250                               BF
•712 POKEV,122:POKEV+1,85:POKEV+39,6:POKE
2040,255                                    BK
•715 POKEV+45,7:POKEV+46,7:POKEV+21,193:P
RINT"[WHITE][CLEAR]":GOSUB600               JO
•716 SYSXY,31,5:PRINT"[BLUE]"SC:SYSXY,31,
8:PRINTHS:SYSXY,31,11:PRINTMS               JA
•718 SH=3:SYSXY,31,14:PRINTSH               ME
•720 SYSXY,2,15:PRINT"[RED]PRESS [WHITE]F
1[RED] TO SELECT MISSION"                   LL
•725 SYSXY,4,17:PRINT"[c 1]PRESS [WHITE]F
3[c 1] TO START GAME"                       LP
•730 SYSXY,7,19:PRINT"[c 3]PRESS [WHITE]F
7[c 3] TO EXIT"                             KK
•740 GETA$:IFA$=""THEN740                   JO
•750 IFA$="[F1]"THENMS=MS+1:IFMS=10THENMS
=1                                          JA
•755 SYSXY,31,11:PRINT"[BLUE]"MS            ED
•760 IFA$="[F3]"THEN780                     ML
•770 IFA$="[F7]"THENPOKEV+21,0:PRINT"[WHI
TE][CLEAR]":END                             OM
•775 GOTO740                                CH
•780 SC=0:F=9:T=0:GOSUB680:GOTO500          EG
•800 POKE53281,11:POKE53280,11:POKE646,7:
V=53248:S=54272:PRINT"[CLEAR]":POKEV+21,
0                                           OL
•805 FORI=STOS+23:POKEI,0:NEXT:POKES+24,1
5                                           JL
•806 POKES+5,0:POKES+6,14:POKES+1,150       DE
•808 POKE53270,PEEK(53270)AND239:POKEV+28
,0                                          AN
•810 FORI=249TO255:FORJ=0TO63:READK:POKE6
4*I+J,K:NEXT:NEXT                           BD
•815 POKE2040,249:POKE2041,250:POKEV+29,3
:POKEV+23,3                                 NE
•820 POKEV+39,0:POKEV+40,0:POKES+4,129:PO
KES+4,128                                   IB
•825 POKEV,136:POKEV+2,184:POKEV+1,110:PO
KEV+3,110:POKEV+21,3                        MK
•828 FORI=0TO240:POKES+1,I:POKEV+39,I:POK
EV+40,I:NEXT                                CI
•830 PRINT"[17"[DOWN]"][YELLOW]"SPC(7)"PL
UG JOYSTICK INTO PORT 2"                    BL
•835 PRINT"[DOWN][DOWN]"SPC(13)"[c 7]LOAD
ING DATA"                                   EC
•845 POKE56334,PEEK(56334)AND254:POKE1,PE
EK(1)AND251                                 BE
•850 FORI=0TO511:POKEI+14336,PEEK(I+53248
):NEXT                                      GC
•855 POKE1,PEEK(1)OR4:POKE56334,PEEK(5633
4)OR1                                       IE
•860 POKE53272,(PEEK(53272)AND240)+14       LK
•865 READK:IFK=-1THEN875                    KI
•870 FORI=0TO7:READJ:POKE14336+K*8+I,J:NE
XT:GOTO865                                  DD
•875 FORI=832TO860:READJ:POKEI,J:NEXT       FD
•878 FORI=1TO9:READWL$(I):NEXT:FORI=1TO8:
READLZ$(I):NEXT                             PM
•880 FORI=49152TO49577:READJ:POKEI,J:NEXT MJ
•885 FORI=50432TO50633:READJ:POKEI,J:NEXT IB
•890 MS=1:SH=3:POKE53245,0:SYS49553:GOTO7
00                                          KN
•900 DATA1,223,124,1,68,17,2,68             MC
•901 DATA17,3,196,17,4,68,17,4              FG
•902 DATA68,17,8,68,17,8,0,0                IC
•903 DATA16,0,0,31,156,56,32,34             ME
•904 DATA68,60,34,68,64,66,121,64           BA
•905 DATA68,145,128,68,144,128,56,136       BF
•906 DATA0,0,0,0,0,0,0,0                    FG
•907 DATA0,0,0,0,0,0,0,0                    FG
•908 DATA227,145,0,20,82,0,20,20            FD
•909 DATA0,244,24,0,20,20,0,20              CN
•910 DATA82,0,19,145,0,0,0,0                KI
•911 DATA0,0,0,112,240,0,137,0              KA
•912 DATA0,129,0,0,3,192,0,2                GH
•913 DATA0,0,148,0,0,103,192,0              GE
•914 DATA0,0,0,0,0,0,0,0                    FG
•915 DATA0,0,0,0,0,0,0,2                    FI
•916 DATA10,160,0,42,168,0,234,171          KM
•917 DATA0,186,175,0,171,255,0,170          DA
•918 DATA255,0,170,255,0,170,255,0          IJ
•919 DATA170,255,0,170,255,0,170,255        IA
•920 DATA0,170,255,0,170,255,0,170          DH
•921 DATA255,0,170,255,0,170,255,0          IJ
•922 DATA170,255,0,170,255,0,42,252         GP
•923 DATA0,10,240,0,0,0,0,0                 MJ
•924 DATA0,0,0,0,0,0,0,0                    FG
•925 DATA0,0,0,0,0,0,0,0                    FG
•926 DATA0,0,0,168,0,10,170,128             PF
•927 DATA42,170,160,86,170,84,169,85        CC
•928 DATA168,42,170,160,10,170,128,0        BK
```

```
•929 DATA168,0,0,0,0,0,0,0                   AE
•930 DATA0,0,0,0,0,0,0,0                     FG
•931 DATA0,0,0,0,0,0,0,18                    IC
•932 DATA0,0,0,2,10,0,0,0                    IG
•933 DATA0,2,8,8,32,34,0,0                   OL
•934 DATA138,128,10,10,0,2,168,162           HK
•935 DATA138,42,162,34,136,128,40,170        EO
•936 DATA162,10,170,32,34,170,136,10         MJ
•937 DATA40,168,136,170,32,0,34,136          IF
•938 DATA2,138,128,32,40,32,8,32             OO
•939 DATA128,0,2,8,0,32,0,255                PN
•940 DATA0,0,0,0,0,0,0,0                     FG
•941 DATA0,0,0,0,128,0,32,128                LE
•942 DATA0,32,128,0,32,128,0,32              OL
•943 DATA128,0,32,128,0,032,0,0              AA
•944 DATA0,0,0,0,0,0,0,0                     FG
•945 DATA0,0,0,0,0,0,0,0                     FG
•946 DATA0,0,0,0,0,0,0,0                     FG
•947 DATA0,0,0,0,0,0,0,0                     FG
•948 DATA0,64,0,0,64,0,0,64                  CI
•949 DATA0,0,224,0,0,224,0,1                 NF
•950 DATA176,0,1,16,0,1,16,0                 DA
•951 DATA1,176,0,1,240,0,1,240               IG
•952 DATA0,6,236,0,14,238,0,14               EF
•953 DATA174,0,29,183,0,189,183,160          DM
•954 DATA253,183,224,253,183,224,7,28        PI
•955 DATA0,0,0,0,0,0,0,0                     FG
•956 DATA0,216,216,216,216,216,216,216,21
 6                                           PP
•957 DATA27,27,27,27,27,27,27,27,27          PF
•958 DATA28,27,27,27,24,15,0,0,0             PN
•959 DATA29,0,0,15,24,27,27,27,27            FE
•960 DATA30,0,0,255,0,255,0,0,0              EL
•961 DATA31,216,216,216,24,240,0,0,0         HJ
•962 DATA33,0,1,15,15,29,60,124,126          GK
•963 DATA35,0,128,240,240,184,60,62,126      EJ
•965 DATA38,8,90,52,191,90,52,74,16          KI
•966 DATA45,85,85,255,255,255,255,255,255    EA
•967 DATA44,85,93,245,245,245,245,244,240    EM
•968 DATA47,21,85,255,255,255,255,255,255    EM
•969 DATA63,0,0,240,24,216,216,216,216       EK
•970 DATA39,255,255,255,255,255,255,255,2
 55,-1                                       ED
•971 DATA32,253,174,32,138,173,32,247,183    BO
•972 DATA152,72,32,253,174,32,138,173,32     AD
•973 DATA247,183,152,170,104,168,24,32       KF
•974 DATA240,255,96                          GL
•980 DATA"--,[3" "]/[22"-"]"                 FE
•981 DATA"[6"-"],[3" "]/[18"-"]"             GM
•982 DATA"[10"-"],[3" "]/[14"-"]"            FE
•983 DATA"[14"-"],[3" "]/[10"-"]"            DM
•984 DATA"[18"-"],[3" "]/[6"-"]"             DE
•985 DATA"[22"-"],[3" "]/--"                 GM
•986 DATA"--,[3" "]/[5"-"],[3" "]/[5"-"],
[3" "][3"-"]"                                BC
•987 DATA"[3" "]/[21"-"],[3" "]"             OG
•988 DATA"--,[3" "]/[15"-"],[3" "]/--"       IB
•990 DATA"  [WHITE]![RED][11"%"][WHITE]#"    DG
•991 DATA"  [WHITE]![RED][6"%"][WHITE]#[4
" "]![RED][6"%"][WHITE]#  "                  KI
•992 DATA"[7" "][WHITE]![RED][13"%"][WHIT
E]#"                                         NK
•993 DATA"[13" "][WHITE]![RED][12"%"][WHI
TE]#"                                        IC
•994 DATA"  [WHITE]![RED]%%[WHITE]#[3" "]
![RED]%%[WHITE]#[3" "]![RED]%%[WHITE]#[3
" "]![RED]%%[WHITE]#"                        CP
•995 DATA"[3" "][WHITE]![RED][21"%"][WHIT
E]#"                                         IC
•996 DATA"[WHITE]![RED][5"%"][WHITE]#[4"
"]![RED][5"%"][WHITE]#[4" "]![RED][5"%"]
[WHITE]#"                                    CN
•997 DATA" [WHITE]![RED]%[WHITE]#[3" "]![
RED]%%[WHITE]#[3" "]![RED][3"%"][WHITE]#
[3" "]![RED][4"%"][WHITE]#"                  MG
•1000 DATA173,253,207,240,37,173,0,220,41
,16,240,5,169,0,141,249,207,173              NH
•1001 DATA2,207,208,6,32,45,192,32,112,19
2,173,3,207,208,3,32,3,193,32                BN
•1002 DATA198,192,32,74,193,108,254,207,1
73,0,220,174,0,208,41,8,240,10               IM
•1003 DATA224,26,240,23,206,0,208,206,0,2
08,173,0,220,41,4,240,10,224                 GA
•1004 DATA238,240,6,238,0,208,238,0,208,1
73,0,220,41,1,208,12,174,1,208               GP
•1005 DATA224,165,144,15,206,1,208,208,10
,174,1,208,224,210,240,3,238,1               JN
•1006 DATA208,96,173,252,207,240,23,174,3
,208,224,35,144,60,206,3,208,206             KE
•1007 DATA3,208,206,3,208,173,3,208,141,1
,212,96,173,249,207,208,39,173               GG
•1008 DATA0,220,41,16,208,32,169,1,141,24
9,207,141,252,207,169,2,13,21                KG
•1009 DATA208,141,21,208,173,1,208,141,3,
208,32,64,193,173,0,208,141,2                EK
•1010 DATA208,96,169,253,45,21,208,141,21
,208,169,0,141,252,207,96,173,251            IF
•1011 DATA207,201,7,208,11,162,7,189,243,
192,157,39,57,202,208,247,173                LC
•1012 DATA251,207,201,12,208,16,169,0,141
,251,207,162,7,189,251,192,157               EF
•1013 DATA39,57,202,208,247,238,251,207,9
6,0,12,63,243,192,0,0,0,0,192                GC
•1014 DATA243,63,12,0,0,0,173,21,208,41,4
,201,4,240,1,96,173,250,207,240              NO
•1015 DATA23,173,4,208,201,231,176,10,238
,4,208,238,4,208,238,4,208,96                FL
•1016 DATA169,0,141,250,207,96,173,4,208,
201,27,144,10,206,4,208,206,4                CJ
•1017 DATA208,206,4,208,96,169,1,141,250,
207,96,162,129,142,4,212,202,142             EN
•1018 DATA4,212,96,173,30,208,141,16,207,
41,1,240,3,141,2,207,173,16                  HM
•1019 DATA207,41,6,201,6,208,8,169,1,141,
3,207,32,184,192,173,16,207,41               GB
•1020 DATA10,201,10,208,8,169,1,141,4,207
```

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,32,184,192,173,31,208,141,17             LJ
•1021 DATA207,41,1,240,3,141,2,207,173,17
,207,41,2,240,3,32,184,192,96             MH
•1022 DATA173,20,3,141,254,207,173,21,3,1
41,255,207,120,169,0,141,20,3             MH
•1023 DATA169,192,141,21,3,88,96          PN
•1040 DATA169,152,133,252,169,7,133,253,1
69,152,133,254,169,219,133,255,162        FB
•1041 DATA23,160,28,177,252,141,0,207,177
,254,141,1,207,24,165,252,105             EJ
•1042 DATA40,133,252,165,253,105,0,133,25
3,165,254,105,40,133,254,165,255          NM
•1043 DATA105,0,133,255,173,0,207,145,252
,173,1,207,145,254,56,165,252             AB
•1044 DATA233,40,133,252,165,253,233,0,13
3,253,165,254,233,40,133,254,165          CM
•1045 DATA255,233,0,133,255,136,192,255,2
08,181,160,28,202,224,255,240,28          MI
•1046 DATA56,165,252,233,40,133,252,165,2
53,233,0,133,253,165,254,233,40           IC
•1047 DATA133,254,165,255,233,0,133,255,7
6,20,197,160,28,169,32,145,252            OH
•1048 DATA169,0,145,254,136,192,255,208,2
43,173,21,208,41,4,240,21,24,173          BH
•1049 DATA5,208,105,8,141,5,208,201,240,1
44,8,173,21,208,41,251,141,21             NP
•1050 DATA208,173,21,208,41,8,240,21,24,1
73,7,208,105,8,141,7,208,201              LM
•1051 DATA240,144,8,173,21,208,41,247,141
,21,208,96                                JO
```

PENGUINS

FROM PAGE 16

Starting address in hex: C000
Ending address in hex: CB72
SYS to start: 49152
Flankspeed **required for entry! See page 103.**

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C000: 20 76 C8 20 4D C2 AD 1F 5C
C008: D0 D0 FB AD 1E D0 D0 FB 0F
C010: AD 11 D0 10 FB AE 1F D0 4A
C018: AC 1E D0 AD 00 DC C9 7F 87
C020: D0 03 AD B5 02 8D B5 02 9E
C028: C9 7B D0 3F AD 10 D0 29 35
C030: 01 D0 0A AD 00 D0 C9 16 6A
C038: D0 03 4C 80 C0 AD 00 D0 18
C040: 38 E9 01 8D 00 D0 B0 76 E8
C048: AD 10 D0 49 01 8D 10 D0 8F
C050: AD AB 02 29 FE 8D AB 02 0F
C058: AD AC 02 29 FE 8D AC 02 19
C060: AD AD 02 29 FE 8D AD 02 23
C068: 4C BE C0 C9 77 D0 37 AD 2B
C070: 10 D0 29 01 F0 0A AD 00 24
C078: D0 C9 41 D0 03 4C 3D C0 72
C080: AD 00 D0 18 69 01 8D 00 0F
C088: D0 90 33 AD AB 02 09 01 82
C090: 8D AB 02 AD AC 02 09 01 32
C098: 8D AC 02 AD AD 02 09 01 3C
C0A0: 8D AD 02 4C BE C0 C9 7E F1
C0A8: D0 06 CE 01 D0 4C BE C0 EB
C0B0: C9 7D D0 0A AD 01 D0 C9 1C
C0B8: DE F0 03 EE 01 D0 8A 29 FF
C0C0: 01 F0 0C A9 F0 18 6D B0 8F
C0C8: 02 8D F8 07 4C DC C0 A9 EB
C0D0: F5 8D F8 07 98 29 54 D0 3B
C0D8: 03 CE 01 D0 98 29 AA F0 D9
C0E0: 5C 20 D6 C4 20 D7 C1 20 D2
C0E8: 04 C2 A0 00 A2 03 18 20 2E
C0F0: F0 FF A9 0F A0 C7 20 1E 41
C0F8: AB 20 DA C2 AD B6 02 D0 99
C100: 39 A9 00 85 FB 85 FC A2 89
C108: 18 A0 0E 18 20 F0 FF A9 A1
C110: 9B A0 C7 20 1E AB A5 C5 69
C118: C9 04 D0 FA A9 03 8D B6 A2
C120: 02 A9 0F 8D B7 02 A9 9F 6B
C128: 20 D2 FF A2 18 A0 00 18 8E
C130: 20 F0 FF A9 64 A0 C7 20 D7
C138: 1E AB 4C 3D C1 A9 FE 85 7B
C140: A2 A5 A2 D0 FC 20 97 E0 91
C148: A5 8D C9 FF D0 03 20 A6 DF
C150: C6 A9 12 20 D2 FF A9 9F 0F
C158: 20 D2 FF A0 22 A2 18 18 E0
C160: 20 F0 FF A5 FC A6 FB 20 D6
C168: CD BD A0 06 A2 18 18 20 8D
C170: F0 FF A5 FE A6 FD 20 CD 98
C178: BD CE BA 02 D0 1E A9 19 73
C180: 8D BA 02 A2 03 AC B9 02 D8
C188: 18 20 F0 FF A9 97 A0 C7 5B
C190: 20 1E AB AE B9 02 F0 04 D9
C198: CA 8E B9 02 AD 01 D0 38 65
C1A0: C9 36 B0 30 A9 F0 8D F8 A2
C1A8: 07 A9 F0 85 A2 A5 A2 D0 8B
C1B0: FC AD 1F D0 29 01 F0 03 69
C1B8: 4C E1 C0 20 12 C5 20 C4 84
C1C0: C5 A2 03 A0 00 18 20 F0 F5
C1C8: FF AE B7 02 F0 03 CE B7 AB
C1D0: 02 4C F2 C0 4C 10 C0 A9 99
C1D8: 00 8D 1C D0 A9 FA 8D F8 7E
C1E0: 07 CE 01 D0 A9 FF 85 A2 5A
C1E8: A5 A2 D0 FC AD 01 D0 8D 0C
C1F0: 27 D0 D0 ED A9 01 8D 1C FB
C1F8: D0 A9 F0 8D F8 07 AD 1E BD
C200: D0 D0 FB 60 A9 12 20 D2 AC
C208: FF A9 9F 20 D2 FF AE B6 A9
C210: 02 CA 8E B6 02 F0 28 E0 1E
C218: 02 D0 10 A2 18 A0 19 18 87
C220: 20 F0 FF A9 20 20 D2 FF ED
C228: 4C 4C C2 E0 01 D0 10 A2 E8
C230: 18 A0 18 18 20 F0 FF A9 D3
C238: 20 20 D2 FF 4C 4C C2 A2 49
C240: 18 A0 17 18 20 F0 FF A9 E2
C248: 20 20 D2 FF 60 78 A9 16 F3
C250: 8D 14 03 A9 C3 8D 15 03 08
C258: A9 4A 8D 12 D0 AD 11 D0 4C
C260: 29 7F 8D 11 D0 A9 81 8D 31
C268: 1A D0 58 A9 0A 8D B8 02 A7
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C270: 8D BA 02 A9 0F 8D B7 02 BA
C278: A9 00 8D B0 02 8D B2 02 A4
C280: 8D 25 D0 85 FB 85 FC 85 8D
C288: FD 85 FE 8D 10 D0 8D 17 1E
C290: D0 8D 20 D0 A9 AA 8D 1D DE
C298: D0 A9 01 8D 1C D0 8D B4 D0
C2A0: 02 8D B1 02 8D 26 D0 8D F5
C2A8: B0 02 8D AF 02 A9 E0 8D B2
C2B0: AB 02 8D AC 02 8D AD 02 D7
C2B8: A2 01 BD FC C7 9D 27 D0 74
C2C0: E8 E0 08 D0 F5 A9 03 8D 93
C2C8: B6 02 20 5A C6 A9 FF 8D F9
C2D0: 15 D0 20 93 C4 A9 05 8D 6B
C2D8: B3 02 A9 F0 8D F8 07 A9 60
C2E0: DE 8D 01 D0 A9 A0 8D 00 F6
C2E8: D0 A9 07 8D 27 D0 AD 1E BB
C2F0: D0 D0 FB A9 7D 8D B5 02 FA
C2F8: AD AB 02 29 FE 8D AB 02 B7
C300: AD AC 02 29 FE 8D AC 02 C0
C308: AD AD 02 29 FE 8D AD 02 CA
C310: A9 27 8D B9 02 60 AD 19 51
C318: D0 8D 19 D0 29 01 D0 07 62
C320: AD 0D DC 58 4C 31 EA AD 26
C328: 12 D0 C9 EA D0 03 4C BC 9C
C330: C3 C9 95 F0 58 C9 6E F0 C5
C338: 2F A2 02 BD B4 C7 9D 00 E3
C340: D0 E8 E0 10 D0 F5 A2 01 55
C348: BD E4 C7 9D F8 07 E8 E0 1A
C350: 08 D0 F5 AD AB 02 8D 10 18
C358: D0 A9 06 8D 21 D0 A9 00 02
C360: 8D 2E D0 A9 6E 4C C3 C3 D8
C368: A2 02 BD C4 C7 9D 00 D0 C5
C370: E8 E0 10 D0 F5 A2 01 BD 72
C378: EC C7 9D F8 07 E8 E0 08 9C
C380: D0 F5 AD AC 02 8D 10 D0 12
C388: A9 95 4C C3 C3 A2 02 BD FD
C390: D4 C7 9D 00 D0 E8 E0 10 75
C398: D0 F5 A2 01 BD F4 C7 9D 1B
C3A0: F8 07 E8 E0 08 D0 F5 AD E6
C3A8: AD 02 8D 10 D0 A9 0E 8D 0C
C3B0: 21 D0 A9 09 8D 2E D0 A9 8B
C3B8: EA 4C C3 C3 A9 0B 8D 21 DA
C3C0: D0 A9 4A 8D 12 D0 CE AE 73
C3C8: 02 D0 0C 20 DA C3 AD B7 CB
C3D0: 02 8D AE 02 20 AD C4 4C EF
C3D8: BC FE A2 01 8A 18 0A A8 8D
C3E0: B9 B4 C7 18 69 02 99 B4 E8
C3E8: C7 90 09 BD AC C7 4D AB 75
C3F0: 02 8D AB 02 E8 E0 08 D0 D0
C3F8: E3 A2 01 8A 18 0A A8 B9 8F
C400: C4 C7 38 E9 01 99 C4 C7 D5
C408: B0 09 BD AC C7 4D AC 02 EF
C410: 8D AC 02 E8 E0 08 D0 E3 D2
C418: A2 01 8A 18 0A A8 B9 D4 9F
C420: C7 18 69 01 99 D4 C7 90 31
C428: 09 BD AC C7 4D AD 02 8D ED
C430: AD 02 E8 E0 04 D0 E3 8A EC
C438: 18 0A A8 B9 D4 C7 38 E9 7B
C440: 01 99 D4 C7 B0 09 BD AC 9B
C448: C7 4D AD 02 8D AD 02 E8 33
C450: E0 07 D0 E3 8A 18 0A A8 42
C458: CE AF 02 D0 19 A9 02 8D FB
C460: AF 02 B9 D4 C7 38 E9 01 8B
C468: 99 D4 C7 B0 09 BD AC C7 8A
C470: 4D AD 02 8D AD 02 CE B1 2B
C478: 02 D0 17 A9 05 8D B1 02 52
C480: A9 01 38 ED B0 02 8D B0 42
C488: 02 AD B0 02 18 69 F8 9D 03
C490: F4 C7 60 A2 18 A9 00 9D AF
C498: 00 D4 CA 10 FA A9 F0 8D 6B
C4A0: 06 D4 A9 11 8D 04 D4 A9 46
C4A8: 0F 8D 18 D4 60 CE B3 02 17
C4B0: D0 23 A9 04 8D B3 02 AE 44
C4B8: B2 02 38 E0 5A 90 05 A2 19
C4C0: 00 8E B2 02 BD 04 C8 8D 1C
C4C8: 01 D4 E8 BD 04 C8 8D 00 9F
C4D0: D4 E8 8E B2 02 60 A2 05 D9
C4D8: A9 00 8D 04 D4 A9 0F 8D 2F
C4E0: 07 D4 A9 0A 8D 08 D4 A9 84
C4E8: F0 8D 0C D4 A9 00 8D 0D 8C
C4F0: D4 A9 21 8D 0B D4 A9 EB 93
C4F8: 85 A2 A5 A2 8D 08 D4 8D 61
C500: 0D D4 D0 F6 A9 00 8D 0B EB
C508: D4 A9 11 8D 04 D4 CA D0 99
C510: C7 60 A9 F6 8D F8 07 20 86
C518: 31 C5 A2 0A A9 F6 18 6D E1
C520: B0 02 8D F8 07 A9 EB 85 7B
C528: A2 A5 A2 D0 FC CA D0 EC 69
C530: 60 A9 00 8D 04 D4 A0 03 44
C538: A9 55 8D 0C D4 8D 0D D4 15
C540: 8D 13 D4 8D 14 D4 A9 21 F6
C548: 8D 0B D4 A9 11 8D 12 D4 E4
C550: A9 60 85 02 A9 C8 85 03 DC
C558: A2 06 8A 48 A2 00 A1 02 1A
C560: 8D 08 D4 8D BB 02 E8 A1 A0
C568: 02 8D 07 D4 E8 A1 02 8D ED
C570: 0F D4 E8 A1 02 8D 0E D4 51
C578: AD BB 02 C9 32 D0 08 A9 62
C580: F0 85 A2 A5 A2 D0 FC A9 59
C588: FA 85 A2 A5 A2 D0 FC A5 67
C590: 02 18 69 04 85 02 A5 03 48
C598: 69 00 85 03 68 AA CA F0 59
C5A0: 05 8A 48 4C 5C C5 A9 20 B0
C5A8: 8D 0B D4 A9 10 8D 12 D4 44
C5B0: A9 E6 85 A2 A5 A2 D0 FC 7F
C5B8: 88 F0 03 4C 38 C5 A9 11 3A
C5C0: 8D 04 D4 60 A2 00 AD B9 91
C5C8: 02 0A A8 8A 2A AA 98 0A 7F
C5D0: A8 8A 2A AA 98 0A A8 8A AE
C5D8: 2A AA 98 0A A8 8A 2A AA 58
C5E0: 98 0A A8 8A 2A AA 98 0A 2E
C5E8: A8 8A 2A AA 98 18 65 FB 03
C5F0: 85 FB 8A 65 FC 85 FC A2 84
C5F8: 00 AD B9 02 0A A8 8A 2A C9
C600: AA 98 0A A8 8A 2A AA 98 ED
C608: 0A A8 8A 2A AA 98 0A A8 65
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C610: 8A 2A AA 98 0A A8 8A 2A 6F
C618: AA 98 18 65 FB 85 FB 8A E0
C620: 65 FC 85 FC A2 00 AD B9 0F
C628: 02 0A A8 8A 2A AA 98 0A DE
C630: A8 8A 2A AA 98 18 65 FB 4A
C638: 85 FB 8A 65 FC 85 FC A5 CE
C640: FE 38 C5 FC F0 04 B0 11 F0
C648: 90 07 A5 FD 38 C5 FB B0 2E
C650: 08 A5 FB 85 FD A5 FC 85 A5
C658: FE 60 A9 93 20 D2 FF A9 91
C660: 05 20 D2 FF A2 00 8A 48 CD
C668: A9 DD A0 C6 20 1E AB 68 A9
C670: AA E8 8A 48 E0 03 D0 F0 7C
C678: 68 A9 0F A0 C7 20 1E AB EB
C680: A2 0D A0 00 18 20 F0 FF F9
C688: A9 39 A0 C7 20 1E AB A2 60
C690: 17 A0 00 18 20 F0 FF A9 1B
C698: 39 A0 C7 20 1E AB A9 64 32
C6A0: A0 C7 20 1E AB 60 A9 92 8F
C6A8: 20 D2 FF 20 97 E0 A5 8D 67
C6B0: 29 03 F0 28 48 AC B8 02 A5
C6B8: A2 01 18 20 F0 FF A9 20 4F
C6C0: 20 D2 FF 20 D2 FF 68 AA B9
C6C8: BD A8 C7 8D B8 02 A8 A2 8A
C6D0: 01 18 20 F0 FF A9 92 A0 D7
C6D8: C7 20 1E AB 60 08 0E 12 13
C6E0: DC DC DC DC DC DC DC DC C7
C6E8: 92 A8 20 20 20 20 A8 12 5F
C6F0: DC DC DC 92 A8 20 20 20 23
C6F8: 20 A8 12 DC DC DC 92 A8 A5
C700: 20 20 20 20 A8 12 DC DC F4
C708: DC DC DC DC DC DC 00 99 CE
C710: A8 A8 A8 A8 A8 A8 A8 A8 55
C718: A8 A8 A8 A8 A8 A8 A8 A8 5D
C720: A8 A8 A8 A8 A8 A8 A8 A8 65
C728: A8 A8 A8 A8 A8 A8 A8 A8 6D
C730: A8 A8 A8 A8 A8 A8 A8 A8 75
C738: 00 12 05 20 20 20 20 20 EF
C740: 20 20 20 20 20 20 20 20 41
C748: 20 20 20 20 20 20 20 20 49
C750: 20 20 20 20 20 20 20 20 51
C758: 20 20 20 20 20 20 20 20 59
C760: 20 20 20 00 12 9F C8 49 84
C768: 47 48 3A 20 20 20 20 20 D2
C770: 20 20 20 20 D0 45 4E 47 9C
C778: 55 49 4E 53 20 BA BA BA 09
C780: 20 20 D3 43 4F 52 45 3A F8
C788: 20 20 20 20 20 9D 94 20 7B
C790: 13 00 92 96 4F 4F 00 12 7D
C798: 1C A8 00 12 05 C7 41 4D CA
C7A0: 45 20 CF 56 45 52 21 00 E4
C7A8: 00 0A 13 1C 01 02 04 08 F0
C7B0: 10 20 40 80 00 00 46 55 3D
C7B8: 8C 55 C3 55 FA 55 64 55 BD
C7C0: AA 55 E6 55 00 00 46 75 B8
C7C8: 8C 75 D2 75 1E 75 64 75 80
C7D0: AA 75 DC 75 00 00 64 A5 4D
C7D8: C8 A5 00 A5 64 C8 78 C8 5B
C7E0: FA C8 19 9C 00 F2 F4 F2 35
C7E8: F4 F2 F4 F2 00 F3 F4 F3 95
C7F0: F4 F3 F4 F3 00 F2 F4 F2 9D
C7F8: F4 F3 F4 F8 07 00 03 00 D9
C800: 03 00 01 00 19 1E 15 1F 6F
C808: 19 1E 16 60 00 00 19 1E EC
C810: 16 60 00 00 16 60 10 C3 D0
C818: 10 C3 00 00 10 C3 00 00 BF
C820: 10 C3 00 00 10 C3 00 00 C7
C828: 12 D1 15 1F 16 60 19 1E ED
C830: 00 00 19 1E 19 1E 12 D1 82
C838: 19 1E 12 D1 16 60 12 D1 AD
C840: 19 1E 15 1F 19 1E 10 C3 B6
C848: 00 00 10 C3 00 00 10 C3 EF
C850: 00 00 12 D1 15 1F 16 60 DE
C858: 19 1E 00 00 19 1E 01 01 C8
C860: 19 1E 12 D1 21 87 19 1E 5B
C868: 2A 3E 1F A5 32 3C 25 A2 CB
C870: 2A 3E 1F A5 32 3C A9 B1 67
C878: 85 02 A9 C8 85 03 A9 00 A4
C880: 85 04 A9 3C 85 05 A2 0B 28
C888: A0 00 B1 02 91 04 C8 C0 FB
C890: 40 D0 F7 A5 02 18 69 40 03
C898: 85 02 A5 03 69 00 85 03 BA
C8A0: A5 04 18 69 40 85 04 A5 3B
C8A8: 05 69 00 85 05 CA D0 D8 16
C8B0: 60 00 00 00 00 00 00 00 11
C8B8: 00 00 00 08 00 00 08 00 C8
C8C0: 00 26 00 00 15 00 00 15 11
C8C8: 00 00 55 41 01 55 54 05 0F
C8D0: 55 54 11 55 50 01 55 50 D7
C8D8: 01 55 50 01 55 50 01 55 7C
C8E0: 50 01 55 50 00 55 40 00 6D
C8E8: 15 00 01 51 00 00 01 50 A1
C8F0: 00 00 00 00 00 00 00 00 F0
C8F8: 00 00 00 08 00 00 08 00 09
C900: 00 26 00 00 15 00 00 15 50
C908: 00 10 55 40 05 55 50 05 5D
C910: 55 54 01 55 51 01 55 50 08
C918: 01 55 50 01 55 50 01 55 BB
C920: 50 01 55 50 00 55 40 00 AC
C928: 15 00 00 11 50 01 50 00 EF
C930: 0A 00 00 00 00 00 00 00 3A
C938: 00 00 00 00 00 00 00 00 38
C940: 00 70 00 00 38 00 00 1C 05
C948: 00 00 1F F0 80 7F FC 81 D6
C950: FF 2F C7 FF FF FF FF FC 44
C958: 7F FF F0 00 04 20 00 02 EE
C960: 40 01 55 80 00 2A 00 00 A1
C968: 00 00 00 00 00 00 00 00 68
C970: 00 00 00 00 00 00 00 00 70
C978: 00 00 00 00 00 00 00 00 78
C980: 00 0E 00 00 1C 00 00 38 E2
C988: 00 0F F8 00 3F FE 01 F4 C4
C990: FF 81 FF FF E3 3F FF FF 35
C998: 0F FF FE 04 20 00 02 40 0D
C9A0: 00 01 AA 80 00 54 00 00 21
C9A8: 00 00 00 00 00 00 00 00 A8
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C9B0: 00 00 00 00 00 00 00 00 B0
C9B8: 00 00 00 00 00 00 00 00 B8
C9C0: 00 20 00 01 32 00 03 FF 17
C9C8: 20 07 FF 60 1F FF F0 3F 9F
C9D0: FF FC FF FF FF 00 00 00 CD
C9D8: 00 00 00 00 00 00 00 00 D8
C9E0: 00 00 00 00 00 00 00 00 E0
C9E8: 00 00 00 00 00 00 00 00 E8
C9F0: FF 00 00 00 00 00 00 00 F0
C9F8: 00 00 00 08 00 00 08 00 09
CA00: 00 26 00 00 15 00 00 15 50
CA08: 00 05 55 54 11 55 51 11 7F
CA10: 55 51 01 55 50 00 55 40 F2
CA18: 00 00 0C 0C C3 00 00 00 F3
CA20: C0 0C 0C 0C 00 C0 C0 00 86
CA28: 00 00 00 00 00 00 00 00 28
CA30: 00 00 26 00 00 19 00 00 6F
CA38: 3B 00 10 7F 41 05 FF D4 1E
CA40: 05 FF D4 01 FF D0 01 FF EC
CA48: D0 01 FF D0 01 FF D0 01 BD
CA50: FF D0 01 7F 50 00 5D 40 8F
CA58: 00 15 00 00 11 00 00 51 CF
CA60: 40 01 51 50 01 40 50 00 D4
CA68: 00 00 00 00 00 00 00 00 68
CA70: 0A 00 00 00 00 00 00 00 7A
CA78: 00 00 00 00 00 00 00 00 78
CA80: 00 26 00 00 19 00 00 3B FA
CA88: 00 00 7F 40 01 FF D0 05 1F
CA90: FF D4 11 FF D1 11 FF D1 2B
CA98: 01 FF D0 01 FF D0 01 FF 3D
CAA0: D0 01 7F 50 00 5D 40 00 DF
CAA8: 15 00 00 11 00 01 51 50 71
CAB0: 01 04 3E 00 1C FF 80 2F BF
CAB8: FF C0 F3 FF E2 6C 20 9C 79
CAC0: 00 C0 C0 00 00 00 00 00 42
CAC8: 00 00 00 00 00 00 00 00 C8
CAD0: 00 00 00 00 00 00 00 00 D0
CAD8: 00 00 00 00 00 00 00 00 D8
CAE0: 00 00 00 00 00 00 00 00 E0
CAE8: 00 00 00 00 00 00 00 00 E8
CAF0: 00 04 3E 00 1C FF 80 2F FE
CAF8: FF C8 7B FF E4 E4 40 98 DF
CB00: 00 33 00 00 00 00 00 00 33
CB08: 00 00 00 00 00 00 00 00 08
CB10: 00 00 00 00 00 00 00 00 10
CB18: 00 00 00 00 00 00 00 00 18
CB20: 00 00 00 00 00 00 00 00 20
CB28: 00 00 00 00 00 00 00 00 28
CB30: 00 00 3E 00 00 41 00 18 C7
CB38: 3E 0C 24 00 12 42 1C 21 38
CB40: 81 36 41 80 EB 81 BE 08 ED
CB48: 3D A2 42 45 A5 42 A5 A9 E6
CB50: 42 95 B1 24 8D A1 18 85 CA
CB58: A1 00 85 A1 00 85 60 81 88
CB60: 0A 30 7E 0C 18 42 18 00 97
CB68: C3 00 03 81 C0 01 00 80 F2
CB70: 00 00 FF 70
```

QUICK CHANGE
FROM PAGE 52

```
•5 REM *** QUICK CHANGE *** BUCK CHILDRES
S ***                                    IE
•10 REM *** P.O. BOX 13575 SALEM, OR 9730
9 ***                                    DC
•15 PRINTCHR$(147)"LOADING AND CHECKING D
ATA LINE:":J=50000:L=50:C=11             HF
•20 PRINTCHR$(19)TAB(31)L:PRINT:FORB=0TOC
:READA:IFA<0ORA>255THEN30                JJ
•25 POKEJ+B,A:X=X+A:NEXTB:READA:IFA=XTHEN
35                                       BO
•30 PRINT"ERROR IN DATA LINE:"L:END      HL
•35 X=0:J=J+12:L=L+5:IFL<671THEN20       DH
•40 PRINT"THE DATA IS OK AND LOADED.":PRI
NT                                       HH
•45 PRINT"SYS 5[4"0"] TO SWITCH ON AND OF
F.":END                                  OG
•50 DATA169,106,162,132,160,195,204,1,3,2
08,6,169,1515                            NE
•55 DATA139,162,135,160,227,141,0,3,140,1
,3,76,1187                               HP
•60 DATA251,199,173,0,2,201,65,144,4,201,
91,144,1475                              HL
•65 DATA3,76,139,227,32,237,199,32,217,19
9,133,253,1747                           AI
•70 DATA162,96,134,251,142,138,2,157,0,20
1,232,208,1723                           AP
•75 DATA250,232,169,39,141,248,201,32,79,
199,169,91,1850                          LM
•80 DATA133,252,141,247,201,162,10,32,251
,199,133,254,2015                        MC
•85 DATA166,252,169,100,32,171,199,32,66,
199,32,7,1425                            PE
•90 DATA200,32,228,255,240,245,133,212,20
1,13,208,44,2011                         CI
•95 DATA173,96,201,240,227,169,32,166,252
,157,0,4,1717                            CO
•100 DATA166,251,48,13,169,192,162,24,160
,171,133,251,1740                        GG
•105 DATA132,252,76,159,195,173,192,201,2
08,86,162,139,1975                       NE
•110 DATA134,199,32,251,199,76,52,196,201
,20,208,39,1607                          BO
•115 DATA174,247,201,48,3,76,120,195,169,
0,162,32,1427                            DL
•120 DATA157,192,201,202,16,250,164,254,3
2,162,199,132,1961                       DM
•125 DATA254,140,247,201,169,192,162,171,
133,251,134,252,2306                     MA
•130 DATA76,164,195,166,254,224,26,144,3,
76,171,195,1694                          HK
•135 DATA230,254,166,251,157,0,201,230,25
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1,230,252,32,2254                              OF
•140 DATA210,255,165,252,16,3,141,247,201
,76,164,195,1925                               JH
•145 DATA32,240,199,162,105,32,251,199,16
9,0,162,9,1560                                 AD
•150 DATA157,0,2,172,233,201,208,3,157,23
0,201,202,1766                                 EE
•155 DATA16,242,174,233,201,169,100,157,2
51,4,173,134,1854                              OO
•160 DATA2,157,251,216,32,66,199,32,7,200
,32,228,1422                                   AN
•165 DATA255,240,245,201,13,208,39,173,23
3,201,240,20,2068                              HN
•170 DATA173,235,201,201,2,144,229,32,181
,199,173,238,2008                              NI
•175 DATA201,208,107,173,239,201,208,102,
169,255,141,238,2242                           DC
•180 DATA201,141,239,201,141,230,201,76,2
34,196,201,20,2081                             EC
•185 DATA208,30,172,233,201,240,9,32,162,
199,140,233,1859                               NJ
•190 DATA201,76,60,196,169,32,141,251,4,1
60,79,32,1401                                  IO
•195 DATA162,199,200,132,254,76,244,195,2
01,45,208,20,1936                              BP
•200 DATA174,231,201,208,159,141,231,201,
32,210,255,238,2281                            OH
•205 DATA233,201,32,181,199,76,60,196,201
,48,144,140,1711                               GE
•210 DATA201,58,176,136,174,232,201,224,5
,176,129,157,1869                              LH
•215 DATA0,2,32,210,255,238,232,201,238,2
33,201,76,1918                                 IL
•220 DATA78,196,32,237,199,32,217,199,173
,248,201,32,1844                               GE
•225 DATA79,199,172,192,201,208,8,162,77,
32,140,199,1669                                KG
•230 DATA76,18,197,162,87,32,140,199,162,
96,32,251,1452                                 JH
•235 DATA199,162,96,32,145,199,162,119,32
,251,199,174,1770                              AD
•240 DATA236,201,173,237,201,32,205,189,1
69,45,32,210,1930                              DP
•245 DATA255,173,230,201,208,12,174,238,2
01,173,239,201,2305                            LA
•250 DATA32,205,189,76,59,197,162,128,32,
251,199,162,1692                               FO
•255 DATA38,32,251,199,32,66,199,32,7,200
,32,228,1316                                   EI
•260 DATA255,201,89,240,7,201,78,208,239,
76,120,195,1909                                FJ
•265 DATA169,1,162,8,141,240,201,142,241,
201,32,237,1775                                MF
•270 DATA199,141,138,2,141,245,201,32,127
,199,160,0,1585                                KH
•275 DATA177,253,208,3,76,116,164,32,15,1
99,177,253,1673                                ME
•280 DATA170,32,15,199,177,253,142,250,20
1,141,251,201,2032                             OC
•285 DATA205,237,201,144,7,208,23,236,236
,201,176,18,1892                               MK
•290 DATA32,205,189,32,15,199,162,0,161,2
53,240,82,1570                                 LA
•295 DATA32,15,199,76,152,197,205,239,201
,144,9,208,1677                                NN
•300 DATA199,236,238,201,144,2,208,192,32
,205,189,169,2015                              KM
•305 DATA32,32,210,255,32,15,199,169,39,1
62,201,141,1487                                FB
•310 DATA249,201,141,253,201,134,252,169,
96,162,0,133,1991                              DI
•315 DATA251,142,242,201,142,246,201,161,
253,240,23,32,2134                             II
•320 DATA88,198,173,242,201,205,246,201,2
08,88,162,0,2012                               KB
•325 DATA161,251,240,91,32,15,199,76,211,
197,142,244,1859                               IN
•330 DATA201,32,240,199,173,245,201,208,1
6,32,15,199,1761                               HD
•335 DATA165,253,166,254,141,240,201,142,
241,201,76,94,2174                             OM
•340 DATA197,162,0,32,251,199,169,19,141,
119,2,169,1460                                 IE
•345 DATA13,141,120,2,141,121,2,141,122,2
,169,4,978                                     KO
•350 DATA133,198,76,116,164,32,127,199,32
,15,199,32,1323                                DJ
•355 DATA15,199,162,0,32,15,199,161,253,2
08,249,76,1569                                 ND
•360 DATA249,197,32,7,200,32,15,199,76,19
9,197,172,1575                                 CP
•365 DATA242,201,32,162,199,141,245,201,1
85,192,201,240,2241                            GE
•370 DATA233,32,195,198,200,76,76,198,166
,212,208,64,1858                               CL
•375 DATA174,253,201,142,249,201,162,18,2
01,131,240,5,1977                              IA
•380 DATA202,201,143,208,3,142,253,201,20
1,128,144,40,1866                              HL
•385 DATA56,233,127,170,160,255,202,240,8
,200,185,158,1994                              BK
•390 DATA160,16,250,48,245,200,185,158,16
0,48,14,238,1722                               EC
•395 DATA243,201,32,156,198,169,0,141,243
,201,76,133,1793                               FG
•400 DATA198,56,233,128,72,162,0,193,251,
208,26,173,1700                                KI
•405 DATA248,201,201,10,240,16,166,212,24
0,7,201,62,1804                                IL
•410 DATA240,8,76,189,198,205,249,201,208
,3,238,246,2061                                IH
•415 DATA201,230,251,238,242,201,104,174,
244,201,48,11,2145                             OO
•420 DATA208,12,166,211,224,79,144,3,142,
244,201,76,1710                                NG
•425 DATA210,255,173,243,201,240,2,104,10
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4,104,104,162,1902                          PJ
•430 DATA192,142,244,201,162,61,32,251,19
9,174,250,201,2109                          MO
•435 DATA173,251,201,32,205,189,169,32,32
,210,255,32,1781                            BI
•440 DATA127,199,169,3,133,252,164,252,17
7,253,240,8,1977                            II
•445 DATA32,88,198,230,252,76,254,198,76,
116,164,230,1914                            HC
•450 DATA253,208,2,230,254,96,201,8,240,2
51,201,11,1955                              BH
•455 DATA240,247,201,16,240,243,201,19,24
0,239,201,24,2111                           HA
•460 DATA240,235,201,27,240,231,201,32,24
0,227,201,35,2110                           DJ
•465 DATA240,223,201,56,240,219,201,59,24
0,215,169,0,2063                            BK
•470 DATA133,198,173,141,2,201,4,208,204,
165,203,201,1833                            DF
•475 DATA64,240,243,160,0,201,39,240,24,1
60,9,201,1581                               BA
•480 DATA10,240,18,160,18,201,17,240,12,1
60,27,201,1304                              KP
•485 DATA18,240,6,160,36,201,62,208,169,1
41,248,201,1690                             OD
•490 DATA162,16,185,249,200,240,121,32,17
1,199,232,200,2007                          LK
•495 DATA76,114,199,173,240,201,174,241,2
01,133,253,134,2139                         KM
•500 DATA254,76,15,199,32,251,199,162,0,1
89,96,201,1674                              MM
•505 DATA240,7,32,210,255,232,76,145,199,
169,34,76,1675                              BF
•510 DATA210,255,169,20,32,210,255,136,20
8,250,96,157,1998                           MK
•515 DATA0,4,173,134,2,157,0,216,96,169,0
,162,1113                                   HO
•520 DATA2,133,122,134,123,141,232,201,32
,121,0,32,1273                              FL
•525 DATA107,169,165,20,174,235,201,157,2
36,201,232,165,2062                         ON
•530 DATA21,157,236,201,232,142,235,201,9
6,162,11,160,1854                           LB
•535 DATA0,24,32,240,255,169,42,160,39,32
,164,199,1356                               IF
•540 DATA162,147,76,251,199,32,68,229,169
,0,133,198,1664                             LN
•545 DATA133,199,133,212,133,216,96,189,2
5,200,240,250,2026                          KL
•550 DATA32,210,255,232,76,251,199,32,225
,255,208,238,2213                           EL
•555 DATA104,104,169,0,141,138,2,32,68,22
9,76,116,1179                               OC
•560 DATA164,13,83,89,83,53,48,55,50,53,0
,17,708                                     KM
•565 DATA13,79,76,68,32,69,78,84,82,89,63
,32,765                                     DJ
•570 DATA0,13,13,78,69,87,32,69,78,84,82,
89,694                                      FO
•575 DATA63,32,0,13,13,18,65,82,69,32,89,
79,555                                      HM
•580 DATA85,32,83,85,82,69,63,32,40,89,47
,78,785                                     LK
•585 DATA41,0,13,13,18,32,84,79,79,32,76,
79,546                                      HK
•590 DATA78,71,32,13,13,0,13,13,69,82,65,
83,532                                      EB
•595 DATA69,32,34,0,13,13,84,85,82,78,32,
34,556                                      OP
•600 DATA0,13,13,73,78,84,79,32,34,0,13,1
3,432                                       PJ
•605 DATA84,72,69,32,82,65,78,71,69,63,32
,0,717                                      PN
•610 DATA13,13,76,73,78,69,83,32,0,69,78,
68,652                                      BG
•615 DATA0,79,78,0,79,70,70,0,32,69,82,65
,624                                        AH
•620 DATA83,69,32,0,13,13,13,67,84,82,76,
32,564                                      JD
•625 DATA65,32,61,32,65,76,76,13,67,84,82
,76,729                                     GB
•630 DATA32,68,32,61,32,68,65,84,65,13,67
,84,671                                     EN
•635 DATA82,76,32,78,32,61,32,78,79,82,77
,65,774                                     LG
•640 DATA76,13,67,84,82,76,32,81,32,61,32
,81,717                                     JG
•645 DATA85,79,84,69,83,13,67,84,82,76,32
,82,836                                     CB
•650 DATA32,61,32,82,69,77,83,19,0,160,14
2,143,900                                   HP
•655 DATA146,141,129,140,160,0,160,160,12
9,140,140,160,1605                          BM
•660 DATA160,160,0,160,160,146,133,141,14
7,160,160,0,1527                            HM
•665 DATA160,160,132,129,148,129,160,160,
0,160,145,149,1632                          MI
•670 DATA143,148,133,147,160,0,0,0,0,0,0,
0,731                                       EP
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MOUNTAINEER MACK
FROM PAGE 18

Starting address in hex: 2000
Ending address in hex: 2D5B
SYS to start: 8192
***Flankspeed* required for entry! See page 103.**

```
2000: A9 08 20 D2 FF A9 93 20 02
2008: D2 FF A9 00 8D 20 D0 A9 AC
2010: 0F 8D 21 D0 20 49 2A 8D BF
2018: 0F D4 EA EA A9 80 8D 12 9B
2020: D4 AD 0E DC 29 FE 8D 0E 51
2028: DC A5 01 29 FB 85 01 A2 F9
2030: 00 BD 00 D0 9D 00 30 E8 75
2038: E0 D8 D0 F5 A2 00 BD 00 19
2040: D1 9D 00 31 E8 E0 FF D0 7B
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2048: F5 A2 00 BD 81 20 C9 21 2B
2050: F0 07 9D D8 31 E8 4C 4B 70
2058: 20 A2 00 BD 96 20 C9 21 7A
2060: F0 07 9D EC 31 E8 4C 5B A4
2068: 20 EA 20 2F 2A EA EA EA AD
2070: A5 01 09 04 85 01 AD 0E 66
2078: DC 09 01 8D 0E DC 4C AA CE
2080: 20 08 1C 2A 08 1C 2A 08 45
2088: FF 08 1C 3E 1E 3C 18 18 75
2090: FF 00 00 18 34 21 66 7E E2
2098: FF 00 00 00 0C 3C 7E 7E DD
20A0: FF 00 00 00 00 00 00 00 A0
20A8: 00 21 AD 18 D0 29 F0 18 92
20B0: 69 0C 8D 18 D0 20 DB 26 BE
20B8: A9 0C 8D 86 02 4C 80 22 73
20C0: 00 28 00 00 AA 00 00 AA 3E
20C8: 00 80 AA 02 80 AA 02 40 63
20D0: 28 01 F0 3C 0F 55 55 55 36
20D8: 3F FF FC 01 55 40 00 FF AB
20E0: 00 00 AA 00 00 FF 00 03 8E
20E8: FF C0 0F FF F0 0F 00 F0 A9
20F0: 0F 00 F0 0A 00 A0 2A 00 C5
20F8: A8 AA 00 AA AA 00 AA 00 4C
2100: 00 28 00 08 AA 20 08 AA AD
2108: 20 04 AA 10 0C AA 30 04 D1
2110: 28 10 0C 3C 30 05 55 50 6B
2118: 0F FF F0 01 55 40 00 FF AE
2120: 00 00 AA 00 00 FF 00 03 CD
2128: FF C0 0F FF F0 03 C3 C0 70
2130: 00 FF 00 00 AA 00 02 AA 87
2138: 80 0A AA A0 0A AA A0 00 63
2140: 0C 00 0C 3F 00 1F 3F 80 76
2148: 3F 7F 00 1E 7A 01 9E 30 6F
2150: 03 C8 00 67 C0 01 FF 80 C5
2158: 03 FF 80 03 FF C0 07 FF A6
2160: C0 07 FF E0 03 FF E0 01 ED
2168: FF E0 01 FF F0 03 FF F0 2F
2170: 07 FF F0 0F FF E0 0F FF 67
2178: C0 07 CB C0 03 81 80 00 D1
2180: 00 10 00 00 38 00 00 7C 45
2188: 00 00 FE 00 01 FF 00 00 88
2190: 7C 00 00 FE 00 01 FF 00 0D
2198: 03 FF 80 00 7C 00 00 FE 97
21A0: 00 01 FF 00 03 FF 80 07 2C
21A8: FF C0 00 FE 00 01 FF 00 69
21B0: 03 FF 80 07 FF C0 0F FF 0B
21B8: E0 00 38 00 00 38 00 00 0A
21C0: 00 00 00 00 00 00 00 00 C0
21C8: 00 00 00 00 00 00 00 00 C8
21D0: 00 00 00 00 00 00 03 00 D3
21D8: 00 33 00 00 33 00 00 73 B2
21E0: 00 00 73 30 00 77 30 03 2F
21E8: 77 70 03 77 70 03 77 70 A6
21F0: 0A 7B 70 0A AA 68 2A AA D8
21F8: AA 2A AA AA 08 88 88 00 3C
2200: 00 00 00 00 00 00 00 00 00
2208: 00 00 00 00 00 00 00 00 08
2210: 00 00 0E 00 00 1F 07 F0 35
2218: 1B FF F8 FF FF F8 FF FF 25
2220: FC 1F FF FC FF FF FC 0F 45
2228: FF FE 03 FF FE 01 FF FE 29
2230: 03 C0 7E 03 80 3F 07 80 BC
2238: FF 3F 03 FF 3E 03 FE 00 BA
2240: 00 00 80 00 01 C0 00 03 85
2248: E0 00 06 B0 00 07 F0 00 D7
2250: 03 E0 00 01 C0 00 03 80 79
2258: 00 0F 00 00 00 00 03 FF 6A
2260: 80 07 FF C0 03 FF 80 00 2C
2268: 00 00 03 FF 80 07 FF C0 B3
2270: 43 FF 80 60 00 00 7F FF 14
2278: 80 3F FF C0 1F FF 80 00 98
2280: A9 13 20 D2 FF A2 00 A0 73
2288: 00 20 A1 23 20 D2 FF C8 29
2290: C0 28 D0 F5 A0 00 E8 E0 AA
2298: 17 D0 EE 20 A5 22 4C 07 AA
22A0: 24 AD 1B D4 60 A2 17 A0 1D
22A8: 00 20 D0 2B 20 ED 26 A2 9B
22B0: 00 BD 7F 2C F0 07 20 D2 05
22B8: FF E8 4C B1 22 60 AD 00 CF
22C0: DC A0 00 A2 00 4A B0 01 DC
22C8: 88 4A B0 01 C8 4A B0 01 12
22D0: CA 4A B0 01 E8 4A 8E 9A F3
22D8: 42 8C 9B 42 60 20 78 2A A8
22E0: 20 78 2A AD 75 42 F0 0B 05
22E8: A9 01 8D 9B 42 20 9B 25 DF
22F0: 4C E3 22 20 1D 27 A9 83 D4
22F8: 8D F8 07 A2 00 BD 77 42 A0
2300: C9 30 D0 08 E8 E0 04 D0 71
2308: F4 4C F4 2A A9 00 85 FB 93
2310: A9 28 85 FD A9 04 85 FE 97
2318: 85 FC A0 00 B1 FD 91 FB 78
2320: E6 FD A5 FD C9 00 D0 02 45
2328: E6 FE A5 FE C9 07 D0 06 5A
2330: A5 FD C9 98 F0 0D E6 FB 17
2338: A5 FB C9 00 D0 DE E6 FC 37
2340: 4C 1C 23 20 9C 2A 4C FB FA
2348: 22 A9 97 85 FB A9 6F 85 CB
2350: FD A9 07 85 FE 85 FC A0 A6
2358: 00 B1 FD 91 FB C6 FD A5 FF
2360: FD C9 FF D0 02 C6 FE A5 66
2368: FE C9 03 D0 06 A5 FD C9 78
2370: FF F0 0D C6 FB A5 FB C9 9C
2378: FF D0 DE C6 FC 4C 59 23 B4
2380: 20 5C 26 20 73 2B A9 0C 97
2388: 8D 86 02 A2 00 A0 00 20 02
2390: D0 2B AD 82 42 F0 06 20 16
2398: B2 29 4C A0 23 20 35 2D 07
23A0: 60 20 A1 22 C9 3B 90 F9 74
23A8: C9 40 B0 F5 60 A0 00 A9 04
23B0: 30 99 6C 42 C8 C0 04 D0 87
23B8: F8 A9 3F 8D 15 D0 8D 1D B8
23C0: D0 A9 3D 8D 17 D0 A9 00 97
23C8: 8D 81 42 8D 8D 42 8D 27 2C
23D0: D0 8D 29 D0 8D 10 D0 8D 25
23D8: 80 42 A9 05 8D 1C D0 8D 52
23E0: 2A D0 8D 2B D0 A9 06 8D A2
```

```
23E8: 25 D0 A9 02 8D 26 D0 A9 B8
23F0: 0B 8D 28 D0 A9 85 8D F9 39
23F8: 07 A9 87 8D FA 07 A9 86 F0
2400: 8D FB 07 8D FC 07 60 20 A2
2408: AD 23 20 58 28 20 B0 27 71
2410: 20 61 29 AD 81 42 F0 08 25
2418: 20 86 28 A9 00 8D 81 42 E1
2420: AC 8A 42 F0 03 4C DD 22 D9
2428: 20 BE 22 AD 9A 42 F0 08 AC
2430: C9 01 F0 3D C9 FF F0 33 17
2438: AD 9B 42 F0 08 C9 01 F0 78
2440: 1A C9 FF F0 03 4C 0D 24 95
2448: AD 75 42 C9 09 B0 06 20 57
2450: 9B 25 4C 0D 24 20 49 23 1B
2458: 4C 0D 24 AD 75 42 C9 01 06
2460: 90 06 20 9B 25 4C 0D 24 55
2468: 4C 20 24 20 77 24 4C 0D 0E
2470: 24 20 A3 24 4C 0D 24 A2 9C
2478: 00 AD 00 D0 C9 18 D0 07 B0
2480: AD 10 D0 29 01 F0 0D AD E4
2488: 00 D0 C9 00 D0 03 20 95 AC
2490: 24 CE 00 D0 60 AD 10 D0 43
2498: 29 FE 8D 10 D0 A9 FF 8D 66
24A0: 00 D0 60 A2 00 AD 10 D0 03
24A8: 29 01 F0 07 AD 00 D0 C9 13
24B0: 29 F0 0D AD 00 D0 C9 FF 20
24B8: D0 03 20 C1 24 EE 00 D0 52
24C0: 60 AD 10 D0 09 01 8D 10 57
24C8: D0 A9 00 8D 00 D0 60 A9 AB
24D0: 08 8D 03 D0 AD 10 D0 29 F1
24D8: FD 8D 10 D0 20 A1 22 C9 F2
24E0: A5 90 15 AD 10 D0 09 02 C5
24E8: 8D 10 D0 20 A1 22 C9 20 25
24F0: B0 F9 8D 02 D0 4C 02 25 6F
24F8: 20 A1 22 C9 19 90 F9 8D D7
2500: 02 D0 60 78 AD 14 03 85 F5
2508: A3 AD 15 03 85 A4 A9 1A 5F
2510: 8D 14 03 A9 25 8D 15 03 29
2518: 58 60 AD 1E D0 29 01 F0 88
2520: 05 A9 01 8D 8A 42 AD 9B 73
2528: 42 D0 0D AD 9A 42 D0 08 AB
2530: A9 83 8D F8 07 4C 66 25 C2
2538: EE 74 42 AD 74 42 C9 05 11
2540: D0 24 AD 8A 42 D0 08 20 A8
2548: 5E 2A A9 10 8D 04 D4 A9 9A
2550: 00 8D 74 42 AD F8 07 C9 0C
2558: 83 D0 06 EE F8 07 4C 66 54
2560: 25 A9 83 8D F8 07 AD 82 70
2568: 42 F0 08 A9 08 8D 03 D0 B6
2570: 4C 98 25 EE 71 42 AD 71 3C
2578: 42 CD 72 42 D0 1A A9 00 D1
2580: 8D 71 42 A2 00 EE 03 D0 27
2588: AD 03 D0 C9 D6 D0 03 20 9E
2590: CF 24 E8 EC 7F 42 D0 ED DA
2598: 6C A3 00 AD 9B 42 30 0F 73
25A0: AD 01 D0 18 69 08 8D 01 38
25A8: D0 CE 75 42 4C BB 25 AD DA
25B0: 01 D0 38 E9 08 8D 01 D0 0C
```

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25B8: EE 75 42 A9 01 20 48 2D 9F
25C0: 60 20 CE 25 20 EB 25 20 86
25C8: 43 26 20 17 26 60 20 A1 B1
25D0: 22 C9 88 90 F9 C9 8A B0 D4
25D8: F5 8D FD 07 C9 89 D0 05 8A
25E0: A9 08 4C E7 25 A9 09 8D 2C
25E8: 2C D0 60 AD 10 D0 29 FB F9
25F0: 8D 10 D0 20 A1 22 C9 80 8D
25F8: 90 12 AD 10 D0 09 04 8D C4
2600: 10 D0 20 A1 22 C9 1E B0 5D
2608: F9 4C 13 26 20 A1 22 C9 35
2610: 20 90 F9 8D 04 D0 60 AD 2B
2618: 10 D0 29 DF 8D 10 D0 20 90
2620: A1 22 C9 80 90 12 AD 10 8E
2628: D0 09 20 8D 10 D0 20 A1 52
2630: 22 C9 1E B0 F9 4C 3F 26 96
2638: 20 A1 22 C9 20 90 F9 8D 1E
2640: 0A D0 60 20 A1 22 C9 20 49
2648: 90 F9 C9 C3 B0 F5 8D 06 9A
2650: D0 20 A1 22 C9 1B B0 F9 94
2658: 8D 08 D0 60 AD 05 D0 C9 6C
2660: BE 90 0B A9 08 8D 05 D0 CF
2668: 20 EB 25 4C 83 26 AD 82 BF
2670: 42 F0 07 AD 05 D0 C9 08 FF
2678: F0 09 AD 05 D0 18 69 08 7F
2680: 8D 05 D0 AD 07 D0 C9 BE F1
2688: 90 0E A9 08 8D 07 D0 8D CB
2690: 09 D0 20 43 26 4C B0 26 17
2698: AD 82 42 F0 07 AD 07 D0 88
26A0: C9 08 F0 0C AD 07 D0 18 0D
26A8: 69 08 8D 07 D0 8D 09 D0 E6
26B0: AD 0B D0 C9 BE 90 0E A9 0B
26B8: 08 8D 0B D0 20 17 26 20 A7
26C0: CE 25 4C DA 26 AD 82 42 74
26C8: F0 07 AD 0B D0 C9 08 F0 0D
26D0: 09 AD 0B D0 18 69 08 8D 7A
26D8: 0B D0 60 AD 11 D0 29 EF BD
26E0: 8D 11 D0 60 AD 11 D0 09 49
26E8: 10 8D 11 D0 60 A9 00 8D FF
26F0: 86 02 60 A9 B8 8D 01 D0 9B
26F8: A9 08 8D 05 D0 A9 50 8D 95
2700: 07 D0 8D 09 D0 A9 88 8D FE
2708: 0B D0 A9 96 8D 00 D0 A9 2C
2710: 83 8D F8 07 AD 10 D0 29 D8
2718: FE 8D 10 D0 60 78 A5 A3 A7
2720: 8D 14 03 A5 A4 8D 15 03 B4
2728: 58 60 A9 33 8D 70 42 A0 9E
2730: 00 A9 30 99 68 42 C8 C0 D7
2738: 04 D0 F8 A0 00 99 77 42 F9
2740: C8 C0 08 D0 F8 A9 31 8D 04
2748: 7B 42 A9 00 8D 71 42 8D 7E
2750: 74 42 8D 75 42 A9 04 8D 87
2758: 7F 42 A9 02 8D 72 42 AD B5
2760: 10 D0 29 F7 09 10 8D 10 19
2768: D0 A9 31 8D 76 42 60 A2 5D
2770: 0C A0 0B 20 D0 2B A0 00 E4
2778: 20 6F 2C 60 A2 0D A0 0D F1
2780: 20 D0 2B A0 12 20 6F 2C 0B
```

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2788: 60 A2 0D A0 0C 20 D0 2B 61
2790: A0 20 20 6F 2C 60 A2 0B 1B
2798: A0 0F 20 D0 2B A0 2F 20 54
27A0: 6F 2C 60 A2 0D A0 0C 20 19
27A8: D0 2B A0 39 20 6F 2C 60 9A
27B0: 20 ED 26 A2 17 A0 07 20 66
27B8: D0 2B AD 70 42 20 D2 FF 08
27C0: A2 17 A0 12 20 D0 2B A0 E9
27C8: 00 B9 6C 42 20 D2 FF C8 EC
27D0: C0 04 D0 F5 A2 17 A0 22 D8
27D8: 20 D0 2B A0 00 B9 68 42 F9
27E0: 20 D2 FF C8 C0 04 D0 F5 28
27E8: A2 18 A0 06 20 D0 2B AD 14
27F0: 76 42 20 D2 FF A2 18 A0 F7
27F8: 10 20 D0 2B A0 00 B9 7B FA
2800: 42 20 D2 FF C8 C0 04 D0 93
2808: F5 A2 18 A0 22 20 D0 2B 97
2810: A0 00 B9 77 42 20 D2 FF 17
2818: C8 C0 04 D0 F5 60 20 BE AB
2820: 22 B0 FB 60 A9 FC A2 01 99
2828: 9D 00 D0 E8 E8 E0 0D D0 27
2830: F7 60 A9 00 8D 85 42 A9 31
2838: 13 20 D2 FF 20 35 2D EE AF
2840: 85 42 AD 85 42 C9 0F D0 27
2848: F3 60 20 1D 27 A9 83 8D BB
2850: F8 07 A9 25 20 48 2D 60 15
2858: 20 27 2D AD 80 42 F0 19 47
2860: AD 8D 42 F0 0B 20 E4 26 05
2868: 20 1F 2B A9 00 8D 8D 42 D9
2870: 20 96 27 20 A3 27 4C 7C 02
2878: 28 20 7C 27 20 51 2C 20 22
2880: 2A 27 20 2E 2D 60 20 27 F4
2888: 2D AD 70 42 C9 33 D0 06 E9
2890: 20 E4 26 20 9B 2B 20 89 4C
2898: 27 20 51 2C A9 00 8D 75 0A
28A0: 42 AD 76 42 18 69 01 C9 95
28A8: 37 90 02 A9 31 8D 76 42 93
28B0: A0 00 A9 30 99 77 42 C8 47
28B8: C0 04 D0 F8 AD 7B 42 18 CA
28C0: 69 01 C9 37 90 08 EE 7F 33
28C8: 42 EE 7F 42 A9 31 8D 7B 9F
28D0: 42 20 2E 2D 60 AD 6B 42 4A
28D8: C9 35 D0 35 A9 30 8D 6B B0
28E0: 42 EE 6A 42 AD 6A 42 C9 E2
28E8: 3A 90 2B A9 30 8D 6A 42 F2
28F0: EE 69 42 AD 69 42 C9 3A E8
28F8: 90 1C A9 30 8D 69 42 EE A7
2900: 68 42 AD 68 42 C9 3A 90 97
2908: 0D A9 30 8D 68 42 4C 16 89
2910: 29 A9 35 8D 6B 42 AD 68 69
2918: 42 CD 6C 42 90 2F F0 06 8D
2920: 20 4E 29 4C 4D 29 AD 69 91
2928: 42 CD 6D 42 90 1F F0 03 8B
2930: 4C 20 29 AD 6A 42 CD 6E 5C
2938: 42 90 12 F0 03 4C 20 29 A6
2940: AD 6B 42 CD 6F 42 90 05 B0
2948: F0 03 4C 20 29 60 A2 00 D4
2950: BD 68 42 9D 6C 42 E8 E0 CE
```

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2958: 04 D0 F5 A9 01 8D 8D 42 2B
2960: 60 A2 00 BD 77 42 DD 7B 34
2968: 42 D0 0D E8 E0 04 D0 F3 1B
2970: 20 4A 28 A9 01 8D 81 42 FE
2978: AD 7B 42 38 E9 01 CD 77 4C
2980: 42 D0 13 AD 78 42 C9 39 12
2988: D0 0C AD 79 42 C9 30 D0 99
2990: 05 A9 01 8D 82 42 60 20 13
2998: F3 26 20 C1 25 20 CF 24 CD
29A0: 20 B0 27 20 03 25 AD 1E AC
29A8: D0 A9 00 8D 8A 42 20 E4 82
29B0: 26 60 A9 0C 8D 86 02 A9 AC
29B8: 13 20 D2 FF 20 FA 29 A2 A5
29C0: 00 20 EB 29 E8 EC 84 42 92
29C8: D0 F7 20 FA 29 20 16 2A 36
29D0: A2 00 20 F2 29 E8 E0 03 7C
29D8: D0 F8 A2 00 20 F6 29 E8 6E
29E0: E0 06 D0 F8 60 A9 40 20 FB
29E8: D2 FF 60 20 A1 23 20 D2 F3
29F0: FF 60 EE 83 42 60 CE 84 B9
29F8: 42 60 A2 00 20 E5 29 E8 56
2A00: EC 83 42 D0 F7 60 A9 00 85
2A08: 8D 82 42 A9 03 8D 83 42 5A
2A10: A9 22 8D 84 42 60 A2 00 33
2A18: BD 00 04 C9 00 D0 05 A9 23
2A20: 0E 4C 26 2A A9 0C 9D 00 1E
2A28: D8 E8 E0 C8 D0 EA 60 A2 52
2A30: 00 BD 40 2A C9 21 F0 07 3B
2A38: 9D 00 30 E8 4C 31 2A 60 F6
2A40: FF FF FF FF FF FF FF FF 40
2A48: 21 A0 18 A9 00 99 00 D4 3A
2A50: 88 10 FA A9 0F 8D 18 D4 17
2A58: A9 FF 8D 0E D4 60 A9 28 A4
2A60: 8D 05 D4 A9 44 8D 06 D4 1E
2A68: A9 0D 8D 01 D4 A9 01 8D BA
2A70: 00 D4 A9 11 8D 04 D4 60 C6
2A78: A9 82 8D 05 D4 A9 88 8D CB
2A80: 06 D4 A9 01 8D 01 D4 A9 13
2A88: 00 8D 00 D4 A9 81 8D 04 A7
2A90: D4 A9 09 20 48 2D A9 80 D7
2A98: 8D 04 D4 60 A2 05 BD 00 C4
2AA0: D0 C9 0A B0 05 A9 C0 4C B1
2AA8: AD 2A 38 E9 08 9D 00 D0 19
2AB0: E8 E8 E0 0D D0 E8 20 16 60
2AB8: 2A CE 79 42 CE 79 42 AD A5
2AC0: 79 42 C9 2E D0 20 A9 38 47
2AC8: 8D 79 42 CE 78 42 AD 78 C1
2AD0: 42 C9 2F D0 11 A9 39 8D 5E
2AD8: 78 42 CE 77 42 C9 2F D0 E5
2AE0: 05 A9 30 8D 77 42 A2 16 BF
2AE8: A0 00 20 D0 2B 20 35 2D 28
2AF0: 20 B0 27 60 A9 25 20 48 80
2AF8: 2D CE 70 42 AD 70 42 C9 D1
2B00: 30 D0 0B 20 B0 27 A9 01 AE
2B08: 8D 80 42 4C 0A 24 20 DB CE
2B10: 26 20 2E 2D 4C 0D 24 A2 D1
2B18: 17 A0 12 20 D0 2B 60 A9 08
2B20: 04 8D 8E 42 20 17 2B A9 8E
```

```
2B28: 20 A2 04 20 D2 FF CA 10 BC
2B30: FA A9 04 20 48 2D 20 17 A5
2B38: 2B A0 00 B9 6C 42 20 D2 5F
2B40: FF C8 C0 04 D0 F5 20 4F 04
2B48: 2B CE 8E 42 10 D6 60 A9 04
2B50: 82 8D 01 D4 A9 09 8D 05 7B
2B58: D4 A9 1E 8D 0F D4 A9 15 25
2B60: 8D 04 D4 A9 04 20 48 2D 0A
2B68: A9 14 8D 04 D4 A9 FF 8D C3
2B70: 0F D4 60 20 D5 28 EE 79 3B
2B78: 42 EE 79 42 AD 79 42 C9 98
2B80: 3A 90 17 A9 30 8D 79 42 85
2B88: EE 78 42 AD 78 42 C9 3A 9E
2B90: 90 08 A9 30 8D 78 42 EE 3A
2B98: 77 42 60 A2 08 A0 0C 20 2A
2BA0: D0 2B A0 48 20 6F 2C A9 EA
2BA8: 30 8D 8F 42 A9 09 8D 90 09
2BB0: 42 20 4F 2B A9 10 8D 04 D8
2BB8: D4 20 D5 28 20 B0 27 CE 72
2BC0: 90 42 10 ED EE 8F 42 AD FF
2BC8: 8F 42 CD 76 42 D0 DD 60 30
2BD0: 18 20 F0 FF 60 78 AD 14 94
2BD8: 03 85 A3 AD 15 03 85 A4 F4
2BE0: A9 FA 8D 14 03 A9 2B 8D 8C
2BE8: 15 03 58 60 A9 88 8D 05 7E
2BF0: D4 8D 06 D4 A9 00 8D 8B F0
2BF8: 42 60 AD 8B 42 C9 00 F0 D1
2C00: 26 C9 05 F0 1A C9 14 F0 CE
2C08: 1E C9 19 F0 12 C9 28 F0 EE
2C10: 26 C9 2E F0 0A C9 50 F0 34
2C18: 30 EE 8B 42 6C A3 00 A9 BE
2C20: 80 8D 04 D4 4C 19 2C A9 42
2C28: 01 8D 01 D4 8D 00 D4 A9 98
2C30: 81 8D 04 D4 4C 19 2C A9 53
2C38: 34 8D 01 D4 A9 01 8D 00 08
2C40: D4 A9 81 8D 04 D4 4C 19 0C
2C48: 2C A9 00 8D 8B 42 6C A3 89
2C50: 00 20 6F 27 20 E4 26 20 52
2C58: EC 2B 20 D5 2B 20 1E 28 F7
2C60: 20 1D 27 A9 80 8D 04 D4 55
2C68: 20 DB 26 20 32 28 60 20 85
2C70: ED 26 B9 CE 2C F0 07 20 51
2C78: D2 FF C8 4C 72 2C 60 20 7F
2C80: 20 4D 45 4E 3A 20 33 20 2F
2C88: 20 20 20 48 49 47 48 3A 44
2C90: 20 30 30 30 30 20 20 20 D1
2C98: 20 20 53 43 4F 52 45 3A 90
2CA0: 20 30 30 30 30 20 20 20 E1
2CA8: 4D 54 4E 3A 20 31 20 20 64
2CB0: 45 4C 45 56 2E 3A 20 30 96
2CB8: 30 30 30 20 20 43 55 52 74
2CC0: 52 2E 20 45 4C 45 56 3A C8
2CC8: 20 30 30 30 30 00 50 52 4C
2CD0: 45 53 53 20 46 49 52 45 04
2CD8: 20 42 55 54 54 4F 4E 00 D6
2CE0: 54 4F 20 53 54 41 52 54 34
2CE8: 20 47 41 4D 45 00 46 4F B9
2CF0: 52 20 4E 45 58 54 20 4C 10
2CF8: 45 56 45 4C 00 47 41 4D FB
2D00: 45 20 4F 56 45 52 00 46 E8
2D08: 4F 52 20 41 20 4E 45 57 16
2D10: 20 47 41 4D 45 00 42 4F DC
2D18: 4E 55 53 20 41 57 41 52 5B
2D20: 44 45 44 20 21 21 00 20 70
2D28: DB 26 20 24 28 60 20 06 1D
2D30: 2A 20 97 29 60 A9 0C 8D DE
2D38: 86 02 A0 00 20 A1 23 20 66
2D40: D2 FF C8 C0 28 D0 F5 60 EB
2D48: 8D 87 42 A2 1C A0 00 C8 C7
2D50: D0 FD CA D0 F8 CE 87 42 4C
2D58: D0 F1 60 00 7B
```

128 TO 64 AUTOBOOT

FROM PAGE 50

128-64.BAS

```
•10 CK=0                                              HH
•20 READ A:IF A=256 THEN 40                           FN
•30 CK=CK+A:GOTO 20                                   OF
•40 IF CK<>18681 THEN PRINT"ERROR IN DATA
":END                                                 CM
•50 OPEN 2,8,2,"0:128-64.BIN,P,W"                     NL
•60 PRINT#2,CHR$(0);CHR$(128);                        GK
•70 RESTORE                                           IO
•80 READ A:IF A=256 THEN CLOSE2:END                   HM
•90 PRINT#2,CHR$(A);:GOTO80                           KG
•32768 DATA 16,128,16,128,195,194,205,56              CC
•32776 DATA 48,0,0,0,0,0,162,5                        AI
•32784 DATA 162,5,142,4,128,142,5,128                 JE
•32792 DATA 142,6,128,142,22,208,32,163               AM
•32800 DATA 253,32,80,253,32,21,253,32                NI
•32808 DATA 91,255,88,32,83,228,32,191                EG
•32816 DATA 227,169,0,141,32,208,141,33               BK
•32824 DATA 208,169,147,32,210,255,169,11             NP
•32832 DATA 141,137,2,76,80,128,85,48                 JF
•32840 DATA 62,77,48,0,48,58,42,0                     HK
•32848 DATA 169,15,162,8,160,15,32,186                FC
•32856 DATA 255,160,0,185,70,128,240,7                BE
•32864 DATA 153,0,128,200,76,91,128,169               LI
•32872 DATA 5,162,0,160,128,32,189,255                OP
•32880 DATA 32,192,255,169,15,32,195,255              OO
•32888 DATA 169,2,162,8,160,1,32,186                  HA
•32896 DATA 255,160,0,185,76,128,240,7                NK
•32904 DATA 153,0,128,200,76,131,128,169              MO
•32912 DATA 3,162,0,160,128,32,189,255                AF
•32920 DATA 169,0,32,213,255,169,2,32                 LN
•32928 DATA 195,255,162,251,154,76,139,22
7,0,256                                               KB
```

IMPORTANT! Letters on white background are **Bug Repellent** line codes. **Do not enter them!** Pages 101 and 102 explain these codes and provide other essential information on entering *Ahoy!* programs. Refer to these pages **before** entering any programs!

1-0.BAS

```
•10 OPEN15,8,15                                AM
•20 OPEN5,8,5,"#"                              DA
•30 PRINT#15,"B-P:"5;0                         OH
•40 PRINT#5,CHR$(67);CHR$(66);CHR$(77); :
 REM  * CBM CODE *                             EO
•50 PRINT#5,CHR$(0);CHR$(0);CHR$(0);CHR$(
 0);                                           GC
•60 PRINT"[CLEAR]ENTER BOOT MESSAGE":GOSU
 B1000                                         CO
•70 PRINT#5,CHR$(0);                           HN
•80 PRINT#5,"128-64.BIN";                      MG
•90 PRINT#5,CHR$(0);CHR$(76);CHR$(75);CHR
 $(226);CHR$(0);                               DO
•100 PRINT#15,"U2:"5;0;1;0                     KF
•110 CLOSE5:CLOSE15                            BF
•120 END                                       IC
•1000 PRINT"  USE '[BACKARROW]' WHEN DONE
 ."                                            MN
•1005 R$="":POKE212,1                          DE
•1020 GETG$:IFG$=""THEN1020                    NB
•1030 IFG$=CHR$(95)THEN1050                    ML
•1040 R$=R$+G$:POKE216,1:PRINTG$;:GOTO102
 0                                             CF
•1050 POKE212,0:PRINT#5,R$;                    HE
•1060 RETURN                                   IM
```

VAULT OF TERROR
FROM PAGE 58

```
•1 REM VAULT V2.6 BY C.M. BLAKEMORE            HE
•2 POKE53280,.:POKE53281,.:POKE808,234:GO
 TO123                                         NB
•3 VL=FC:ONFC+1GOSUB49,49,58,60,61             JL
•4 RETURN                                      IM
•5 GOSUB3:ONFC+1GOSUB72,62,67,70,71:RETUR
 N                                             HJ
•6 ONFC+1GOSUB74,75,76,77:RETURN               LB
•7 ONFC+1GOSUB78,79,80,81:RETURN               ML
•8 LP=FC:ONFC+1GOSUB82,86,88,90:RETURN         AA
•9 ONFC+1GOSUB91,93,95,96:RETURN               IA
•10 PRINT"[CLEAR][DOWN][RVSOFF] [s M][s O
 ][34"[c Y]"][s P][s N]"                       GN
•11 PRINT" [s M][c H]"TAB(37)"[c N][s N]"      GF
•12 PRINT" [s M][c H]"TAB(37)"[c N][s N]"      GF
•13 PRINT" [s M][c G][3" "][28"[c @]"][3"
 "][c M][s N]                                  EN
•14 PRINT" [s M][c G]  [c M][c *][RVSON][
 26" "][RVSOFF][sEP][c G]  [c M][s N]          PO
•15 PRINT" [s M][c G][SS] [c M] [c *][RVS
 ON][24" "][RVSOFF][sEP] [c G] [SS][c M][
 s N]                                          NF
•16 PRINT" [s M][c G]  [c M] [c M][s M][2
 2"[c T]"][s N][c G] [c G]  [c M][s N]         LH
•17 PRINT" [s M][c G]  [c M] [c M][s M] [
 s O][18"[c Y]"][s P][SS][s N][c G] [c G]
  [c M][s N]                                   EA
•18 PRINT"  [c G]  [c M] [c M][s M] [c G]
 [c M][c *][RVSON][14" "][RVSOFF][sEP][c
 G][c M] [s N][c G] [c G] [SS][c M]            HI
•19 PRINT"  [c G]  [c M] [c M][s M] [c G]
 [c M][c M][s M][12" "][s N][c G][c G][c
 M] [s N][c G] [c G]  [c M]                    HK
•20 PRINT"  [s O][c Y][c Y][s P] [c M][s
 M] [c G][c M][c M][s M][s O][10"[c T]"][
 s P][s N][c G][c G][c M] [s N][c G] [s O
 ][c Y][c Y][s P]                              FE
•21 PRINT"  [c G][RVSON][s U][s I][RVSOFF
 ][c M] [c M][SS] [RVSON][s U][s I][RVSOF
 F][c M][s M][c G][RVSON][s T][8"[c I]"][
 s Y][RVSOFF][c M][s N][c G][RVSON][s U][
 s I][RVSOFF] [SS][c G] [c G][RVSON][s U]
 [s I][RVSOFF][c M]                            PA
•22 PRINT"  [c G][RVSON][s J][s K][RVSOFF
 ][c M] [c M]  [RVSON][s J][s K][RVSOFF][
 c M] [RVSON][s W][s T][RVSOFF][s M][RVSO
 N].[4"[s C]"].[RVSOFF][s N][RVSON][s Y][
 s W][RVSOFF] [c G][RVSON][s J][s K][RVSO
 FF]  [c G] [c G][RVSON][s J][s K][RVSOFF
 ][c M]                                        EH
•23 PRINT"  [s L][c P][c P][s @] [c M][SS
 ] [c G][c M][c M][s N][c G][RVSON][s T][
 RVSOFF][s N][RVSON][s G][RVSOFF][4" "][R
 VSON][s H][RVSOFF][s M][RVSON][s Y][RVSO
 FF][c M][s M][c G][c G][c M] [SS][c G] [
 s L][c P][c P][s @]"                          GL
•24 PRINT" [s N][c G][SS] [c M] [c M][s N
 ] [c G][c M][c M][s N][c G][RVSON][s T][
 RVSOFF][s N][6"[c T]"][s M][RVSON][s Y][
 RVSOFF][c M][s M][c G][c G][c M] [s M][c
  G][SS][c G] [SS][c M][s M]                   IE
•25 PRINT" [s N][c G]  [c M][SS][c M][s N
 ] [c G][c M][c M][s N][s L][sEP][8"[c T]
 "][c *][s @][s M][c G][c G][c M] [s M][c
  G] [c G]  [c M][s M]                         BK
•26 PRINT" [s N][c G][SS][SS][c M][SS][c
 M][s N] [c G][c M][c M][s N][12"[c T]"][
 s M][c G][c G][c M] [s M][c G] [c G]  [c
  M][s M]                                      JE
•27 PRINT" [s N][c G] [SS][c M][SS][c M][
 s N] [s L][s @][s N][14" "][s M][s L][s
 @] [s M][c G] [c G] [SS][c M][s M]            KC
•28 PRINT" [s N][c G][SS][SS][c M] [c M][
 s N][c T][SS] [16"[c T]"]  [c T][s M][c
 G] [c G]  [c M][s M]                          EH
•29 PRINT" [s N][c G][SS][SS][c M][SS][c
 M][24" "][c G] [c G]  [c M][s M]              EK
•30 PRINT" [s N][c G][SS][SS][c M] [s N]"
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TAB(32)"[s M][SS][c G][SS] [c M][s M]"   EK
•31 PRINT" [s N][s L][c P][c P][s @][s N]
 "TAB(33)"[s M][s L][c P][c P][s @][s M]
"                                        MG
•32 PRINT"[39"[c Y]"]"                   BI
•33 PRINT"[RVSON][RED][3" "]";D$(CD);"  [
SS][5" "]#[SS]$[SS]%[SS]&[SS]'[SS]([SS])
[SS]* +[7" "]";D$(CD);"  [RVSOFF]";      MO
•34 PRINTL$(DD);:RETURN                  OH
•35 PRINT"[HOME][DOWN][RVSON][c Y][s P][D
OWN][LEFT][LEFT]";:FORX=.TO19:PRINT" [c
M][DOWN][LEFT][LEFT]";:NEXT:PRINT"[c P][
s @][DOWN][LEFT][LEFT] [RVSOFF][sEP]":RE
TURN                                     AP
•36 PRINT"[HOME][8"[DOWN]"]";TAB(8)"[RVSO
N][c Y][s P][DOWN][LEFT][LEFT]";:FORX=.T
O8:PRINT" [c M][DOWN][LEFT][LEFT]";:NEXT
:PRINT"[c P][s @][DOWN][LEFT][LEFT][RVSO
FF][sEP]"                                JA
•37 RETURN                               IM
•38 PRINT"[HOME][11"[DOWN]"]";TAB(13)"[RV
SON][s P][DOWN][LEFT]";:FORX=.TO3:PRINT"
[c M][DOWN][LEFT]";:NEXT:PRINT"[s @][DOW
N][LEFT][RVSOFF][sEP]"                   NM
•39 RETURN                               IM
•40 PRINT"[HOME][13"[DOWN]"]";TAB(16)"[RV
SON][s P][DOWN][LEFT][s @][DOWN][LEFT][R
VSOFF][sEP]";                            AA
•41 RETURN                               IM
•42 PRINT"[HOME][DOWN][RVSON]";TAB(38)"[s
 O][DOWN][LEFT]";:FORX=.TO19:PRINT"[c G]
[DOWN][LEFT]";:NEXT:PRINT"[s L][DOWN][LE
FT][RVSOFF][c *]":RETURN                 JB
•43 PRINT"[HOME][8"[DOWN]"]"TAB(30)"[RVSO
N][s O][c Y][DOWN][LEFT][LEFT]";:FORX=.T
O8:PRINT"[c G] [DOWN][LEFT][LEFT]";:NEXT
:PRINT"[s L][c P][DOWN][LEFT][RVSOFF][c
*]                                       EF
•44 RETURN                               IM
•45 PRINT"[HOME][11"[DOWN]"]";TAB(26)"[RV
SON][s O][DOWN][LEFT]";:FORX=.TO3:PRINT"
[c G][DOWN][LEFT]";:NEXT:PRINT"[s L][DOW
N][LEFT][RVSOFF][c *]"                   IN
•46 RETURN                               IM
•47 PRINT"[HOME][13"[DOWN]"]";TAB(23)"[RV
SON][s O][DOWN][LEFT][s L][DOWN][LEFT][R
VSOFF][c *]"                             AO
•48 RETURN                               IM
•49 PRINT"[HOME][5"[DOWN]"]";:FORX=.TO3:P
RINTTAB(6);                              FH
•50 PRINT"[s O][c Y][s P][s O][c Y][s P][
s O][c Y][s P][s O][c Y][s P][s O][c Y][
s P][s O][c Y][s P][s O][c Y][s P][s O][
c Y][s P][s O][c Y][s P][s O]"           PN
•51 PRINTTAB(6)"[s L][c P][s @][s L][c P]
[s @][s L][c P][s @][s L][c P][s @][s L]
[c P][s @][s L][c P][s @][s L][c P][s @]
[s L][c P][s @][s L][c P][s @][s L]"     PM
•52 PRINTTAB(6)"[s P][s O][c Y][s P][s O]
[c Y][s P][s O][c Y][s P][s O][c Y][s P]
[s O][c Y][s P][s O][c Y][s P][s O][c Y]
[s P][s O][c Y][s P][s O][c Y][s P]"     NN
•53 PRINTTAB(6)"[s @][s L][c P][s @][s L]
[c P][s @][s L][c P][s @][s L][c P][s @]
[s L][c P][s @][s L][c P][s @][s L][c P]
[s @][s L][c P][s @][s L][c P][s @]"     AA
•54 NEXT                                 IA
•55 PRINTTAB(6)"[s O][c Y][s P][s O][c Y]
[s P][s O][c Y][s P][s O][c Y][s P][s O]
[c Y][s P][s O][c Y][s P][s O][c Y][s P]
[s O][c Y][s P][s O][c Y][s P][s O]"     MG
•56 PRINTTAB(6)"[s L][c P][s @][s L][c P]
[s @][s L][c P][s @][s L][c P][s @][s L]
[c P][s @][s L][c P][s @][s L][c P][s @]
[s L][c P][s @][s L][c P][s @][s L]"     PM
•57 RETURN                               IM
•58 PRINT"[HOME][9"[DOWN]"]";:FORX=.TO4:P
RINTTAB(12);"[s P][c Y][s P][c Y][s P][c
 Y][s P][c Y][s P][c Y][s P][c Y][s P][c
 Y][s P][c Y]"                           BM
•59 PRINTTAB(12);"[c Y][s P][c Y][s P][c
Y][s P][c Y][s P][c Y][s P][c Y][s P][c
Y][s P][c Y][s P]":NEXT:RETURN           AI
•60 PRINT"[HOME][12"[DOWN]"]";:FORX=.TO4:
PRINTTAB(15);"[10"[cEP]"]":NEXT:RETURN   AC
•61 PRINT"[HOME][14"[DOWN]"]";:PRINTTAB(1
8)"[4"[c +]"]":RETURN                    JC
•62 PRINT"[HOME][10"[DOWN]"]";TAB(15)"[RV
SON][10":"]":PRINTTAB(15)"[RVSON]:[RVSOF
F][8"[c Z]"][RVSON]:"                    MO
•63 PRINTTAB(15)"[RVSON]:[RVSOFF][c Z][s
O][4"[c Y]"][s P][c Z][RVSON]:":PRINTTAB
(15)"[RVSON]:[RVSOFF][c Z][c G][4"[s C]"
][c M][c Z][RVSON]:"                     NP
•64 PRINTTAB(15)"[RVSON]:[RVSOFF][c Z][s
L][4"[c P]"][s @][c Z][RVSON]:":PRINTTAB
(15)"[RVSON]:[RVSOFF][7"[c Z]"][RVSON][s
 B]:"                                    KJ
•65 PRINTTAB(15)"[RVSON]:[RVSOFF][7"[c Z]
"][s S][RVSON]:"                         NM
•66 FORX=.TO5:PRINTTAB(15)"[RVSON]:[RVSOF
F][8"[c Z]"][RVSON]:":NEXT:RETURN        OK
•67 PRINT"[HOME][11"[DOWN]"]";:PRINTTAB(1
7)"[RVSON][6":"]":PRINTTAB(17)"[RVSON]:[
RVSOFF][4"[c Z]"][RVSON]:"               FK
•68 PRINTTAB(17)"[RVSON]:[RVSOFF][c Z][s
C][s C][c Z][RVSON]:":PRINTTAB(17)"[RVSO
N]:[RVSOFF][3"[c Z]"][s Q][RVSON]:"      OG
•69 FORX=.TO3:PRINTTAB(17)"[RVSON]:[RVSOF
F][4"[c Z]"][RVSON]:":NEXT:RETURN        OO
•70 PRINT"[HOME][13"[DOWN]"]";TAB(19)"[c
D][c F]":FORX=.TO2:PRINTTAB(19)"[c Z][c
Z]":NEXT:RETURN                          JM
•71 PRINT"[HOME][14"[DOWN]"]";TAB(19)"[c
-][RVSON][c -]":RETURN                   PN
•72 PRINT"[HOME]":FORX=.TO21:PRINT"[s V][
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s V]"TAB(38)"[s +]":NEXT                    LJ
•73 PRINT"[s V][s N][RVSON][36"[c +]"][RV
SOFF][s M]";:GOSUB62:RETURN                 GO
•74 PRINT"[HOME][23"[DOWN]"]";TAB(12)"[RV
SON][sEP][s O][12"[c Y]"][s P][c *]";:RE
TURN                                        NA
•75 PRINT"[HOME][20"[DOWN]"]";TAB(14)"[RV
SON][sEP][s O][8"[c Y]"][s P][c *]";:RET
URN                                         JF
•76 PRINT"[HOME][17"[DOWN]"]";TAB(16)"[RV
SON][sEP][s O][4"[c Y]"][s P][c *]";:RET
URN                                         DH
•77 PRINT"[HOME][15"[DOWN]"]";TAB(18)"[RV
SON][sEP][s O][s P][c *]";:RETURN           FK
•78 PRINT"[HOME]"TAB(12)"[c *][RVSON][s L
][12"[c P]"][s @][RVSOFF][sEP]":RETURN      JL
•79 PRINT"[HOME][7"[DOWN]"]"TAB(14)"[c *]
[RVSON][s L][8"[c P]"][s @][RVSOFF][sEP]
":RETURN                                    HH
•80 PRINT"[HOME][10"[DOWN]"]";TAB(16)"[c
*][RVSON][s L][4"[c P]"][s @][RVSOFF][sE
P]":RETURN                                  LM
•81 PRINT"[HOME][12"[DOWN]"]";TAB(18)"[c
*][RVSON][s L][s @][RVSOFF][sEP]":RETURN    HB
•82 PRINT"[HOME]";:PRINTTAB(14)"[RVSON][c
 M]"TAB(25)"[RVSON][c G]"                   IK
•83 FORX=.TO6:PRINTTAB(14)"[RVSON][c M][1
0"[s E]"][c G]":PRINTTAB(14)"[RVSON][c M
]"TAB(25)"[RVSON][c G]"                     EN
•84 PRINTTAB(14)"[RVSON][c M]"TAB(25)"[RV
SON][c G]":NEXT                             NA
•85 PRINTTAB(14)"[RVSON][c M][10"[s E]"][
c G]":PRINTTAB(14)"[RVSON][c M]"TAB(25)"
[RVSON][c G][HOME]":RETURN                  FO
•86 PRINT"[HOME][7"[DOWN]"]";:FORX=.TO6     GI
•87 PRINTTAB(16)"[RVSON][s Y][6"[s E]"][s
 T]":PRINTTAB(16)"[RVSON][s Y]"TAB(23)"[
RVSON][s T]":NEXT:RETURN                    OM
•88 PRINT"[HOME][10"[DOWN]"]";:FORX=.TO7    JA
•89 PRINTTAB(18)"[RVSON][c D][c I][c I][c
 F]":NEXT:RETURN                            IL
•90 PRINT"[HOME][13"[DOWN]"]";:FORX=.TO2:
PRINTTAB(19)"[c Q][c W]":NEXT:RETURN        LP
•91 PRINT"[HOME][22"[DOWN]"]";TAB(11)"[RV
SON][sEP][s N][14"-"][s M][c *]"            OD
•92 PRINTTAB(10)"[RVSON][sEP][s N][16"-"]
[s M][c *][HOME]":RETURN                    JN
•93 PRINT"[HOME][18"[DOWN]"]";TAB(14)"[RV
SON][sEP][s N][8"="][s M][c *]":PRINTTAB
(14)"[RVSON][s O][10"[c T]"][s P]"          OA
•94 PRINTTAB(14)"[RVSON][s O][c T][c R][6
"[c T]"][c R][c T][s P]":RETURN             BM
•95 PRINT"[HOME][16"[DOWN]"]"TAB(16)"[RVS
ON][sEP][s N][4"="][s M][c *]":PRINTTAB(
16)"[RVSON][s O][c R][4"[c T]"][c R][s P
]":RETURN                                   LO
•96 PRINT"[HOME][15"[DOWN]"]"TAB(17)"[RVS
ON][sEP][4"="][c *]":PRINTTAB(17)"[RVSON
][s O][c R][c T][c T][c R][s P]":RETURN     FB
•97 CEM=FNTE(.):POKE648,CEM:PRINTL$(DD);:
GOSUB10                                     OM
•98 FC=4:VL=FC:LP=FC:LV=CD-1+4*-(CD=1):RV
=CD+1+4*(CD=4)                              ED
•99 EBM=FNCP(.):IFEBM>-1ANDEBM<256THEN102   HG
•100 IFFCTHENFC=FC-1:GOTO99                 KL
•101 RETURN                                 IM
•102 EL=FNCP(LV):ER=FNCP(RV)                PA
•103 IF(DL(EBM,.))THEN105                   DH
•104 GOSUB3:FC=FC-1:ON1-(FC<.)GOTO99,113    BD
•105 IFDL(EL,.)ANDFC<4THENONFC+1GOSUB35,3
6,38,40                                     LA
•106 IFDL(ER,.)ANDFC<4THENONFC+1GOSUB42,4
3,45,47                                     DD
•107 FORD=1TO5:IF(DL(EBM,.)ANDBO(D))THENO
NDGOSUB9,6,7,8,5                            AN
•108 PRINT"[RVSOFF]";:NEXT:FC=FC-1:IFFC>-
1THEN99                                     AK
•109 IFDL(CL,2)=.THEN113                    JE
•110 FORX=.TO8:POKEXR,22:POKEYR,.:POKEPR,
.:SYSPLOT                                   BB
•111 IF(DL(CL,2)ANDBO(X))THENPRINTTAB(X*4
+3);OA$(X)                                  JI
•112 NEXT                                   IA
•113 GOSUB116                               CM
•114 CSM=FNSW(.):POKE53272,(PEEK(53272)AN
D15)ORCSM:POKEFNPM(U),7:RETURN              OB
•115 :                                      DI
•116 IFFCANDVLTHENVL=VL-1                   OI
•117 D=61:POKEFNMP(1),D:POKEFNMP(2),D:POK
EFNMP(3),D:POKEFNMP(5),D                    KF
•118 EL=.:ER=.:FORX=VLTO.STEP-1:FC=FNCM(X
):IFDL(FC,1)=.THEN122                       CD
•119 FC=DL(FC,1)-1:EL=(ELORSP(X+4)):IFX>L
PTHENER=(ERORSP(X+4))                       HI
•120 MB=SP(X)-1:FORD=1TOLEN(SB$(X,FC)):PO
KEFNMP(MB+D),ASC(MID$(SB$(X,FC),D,1))       DG
•121 POKEBC+SP(X)+D,CS(FC):NEXT             AL
•122 NEXT:POKEV+21,EL:POKEV+27,ER:RETURN    JA
•123 POKE56578,PEEK(56578)OR3:POKE56576,(
PEEK(56576)AND252)                          NN
•124 POKE53272,PEEK(53272)AND15:POKE648,1
92:POKE53272,(PEEK(53272)AND240)OR12        JC
•125 POKE53270,PEEK(53270)AND247            FP
•126 PRINTCHR$(147):GOSUB234:GOSUB238       EP
•127 DIMDL(255,2),BO(15),SP(7),SB$(3,7),D
$(4),L$(6),OA$(8),CS(7),M(15),MH(15)        FJ
•128 DIMHC(2):X=.:D=.:FC=.:CL=17:CD=2:VL=
.:EL=.:ER=.:VS=.                            OC
•129 D(1)=1:D(2)=16:D(3)=-1:D(4)=-16:CS(.
)=9:CS(1)=2:CS(2)=6:CS(3)=9:CS(4)=4         II
•130 CS(5)=14:CS(6)=13:CS(7)=1:LP=.:P=.:L
=1:LF=10                                    GG
•131 SP(.)=.:SP(1)=4:SP(2)=6:SP(3)=7:SP(4
)=15:SP(5)=48:SP(6)=64:SP(7)=128            BP
•132 TGL=16:CSM=.:CEM=192:V=53248           FL
•133 D$(1)="E":D$(2)="S":D$(3)="W":D$(4)=
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"N"                                          OC
·134 NJ=255:FJ=254:LJ=251:RJ=247:BJ=253:U
S=239:MU=237:U=.                             KG
·135 TL=388:DD=6:PLOT=65520:AR=780:XR=781
:YR=782:PR=783:S=54272:BC=V+38               JB
·136 RU=156:CU=142:ALL=511:HX=157:WL=17:C
C=204:CR$=CHR$(13)                           KE
·137 DEFFNCP(X)=FC*D(CD)+(CL+D(X)):DEFFNS
W(X)=(TGL-CSM)                               JA
·138 DEFFNTE(X)=(TL-CEM):DEFFNCM(X)=X*D(C
D)+CL:DEFFNMP(X)=CEM*256+1016+X              BM
·139 DEFFNPM(X)=55296+972+(X*2)              EM
·140 FORX=.TO15:BO(X)=2[UPARROW]X:NEXT:L$
(.)="[WHITE]":L$(1)="[c 8]":L$(2)="[c 5]
":L$(3)="[c 4]"                              PM
·141 L$(4)="[c 4]":L$(5)="[BLUE]":L$(6)="
[BLACK]":HC(.)=2:HC(1)=8:HC(2)=10            LJ
·142 FORX=.TO239:READD:DL(X,.)=D:NEXT        FE
·143 FORX=.TO8:READA$:OA$(X)=A$:NEXTX        JK
·144 FORX=.TO15:READA:M(X)=A:NEXTX           DF
·145 FORX=3TO.STEP-1:FORD=.TO7:READA$:SB$
(X,D)=A$:NEXTD,X                             GC
·146 FORX=.TO8                               KJ
·147 A=INT(RND(1)*93+34):IFDL(A,.)=.THEN1
47                                           AF
·148 DL(A,1)=M(X):M(X)=A:MH(X)=X*4+1:NEXT    DJ
·149 FORX=9TO15                              NN
·150 A=INT(RND(1)*96+142):IFDL(A,.)=.THEN
150                                          KH
·151 DL(A,1)=M(X):M(X)=A:MH(X)=X*4+1:NEXT    DJ
·152 D=52288:FORX=.TO767:READA:POKED+X,A:
NEXT:FORX=.TO63:POKE53055+X,.:NEXT           LH
·153 PRINT"[c 4]":FORX=.TO8:POKEXR,15:POK
EYR,.:POKEPR,.:SYSPLOT                       PB
·154 PRINTTAB(X*4+2);OA$(X)                  BE
·155 NEXT                                    IA
·156 PRINT"[7"[DOWN]"][RED][RVSON] F1/ ST
ART NEW GAME  F2/ LOAD OLD GAME";:POKE19
8,.                                          DL
·157 GETA$:IFA$<>CHR$(133)ANDA$<>CHR$(137
)THEN157                                     HK
·158 IFA$=CHR$(137)THENGOSUB267              CN
·159 DL(CC,1)=BO(8)                          IK
·160 POKEV+21,.:POKEV+23,127:POKEV+29,15:
POKEV,150:POKEV+1,193:POKEV+2,151            CH
·161 POKEV+3,151:POKEV+4,119:POKEV+5,109:
POKEV+6,167:POKEV+7,109:POKEV+8,164          PE
·162 POKEV+9,174:POKEV+10,164:POKEV+11,13
3:POKEV+12,168:POKEV+13,152                  IK
·163 POKEV+14,172:POKEV+15,160               PH
·164 GOSUB322:GOSUB97:IT=TI+1000             JF
·165 JOY=PEEK(56321)                         LF
·166 IFRND(1)>.93THENPOKES+1,RND(1)*7+2      FM
·167 B=DL(CL,1):IFBANDRND(1)+B/100>.95THE
NGOSUB200                                    AN
·168 IFTI>ITTHENGOSUB247:GOTO181             KN
·169 IFJOY=NJTHEN165                         CF
·170 IF(DL(CL+D(CD),.)ANDBO(5+CD))THEN172    HA
·171 IFJOY=FJANDDL(CL+D(CD),.)THENCL=CL+D
(CD):GOTO180                                 DC
·172 IF(DL(CL-D(CD),.)ANDBO(5))THEN174       HN
·173 IFJOY=BJANDDL(CL-D(CD),.)THENCL=CL-D
(CD):GOTO180                                 NO
·174 IFJOY=RJTHENCD=CD+1:GOTO179             LI
·175 IFJOY=LJTHENCD=CD-1:GOTO179             IP
·176 IFJOY=USTHENONU+1GOSUB210,211,4,219,
221,226,229,4,4:GOTO165                      PB
·177 IFJOY=MUTHENGOSUB185:GOSUB322:GOTO16
5                                            JA
·178 GOSUB319:GOSUB322:GOTO165               PL
·179 CD=CD+((CD=5)*4)+((CD=.)*-4)            DH
·180 GOSUB97:GOTO165                         FP
·181 VS=VS+1:IFVS=DD*6THENVS=.:DD=DD+((DD
<6)*-1):IFDD=6THENL=(LAND254)                EO
·182 LF=LF+((LF<60)*-.2):IF(LAND1)=.THEND
D=6                                          HN
·183 POKEV+32,(LF<5)*-2+(LF>=5ANDLF<10)*-
7                                            CN
·184 GOTO165                                 CK
·185 POKE198,.                               JP
·186 IFCU=14THENCU=142:PRINTCHR$(9);CHR$(
CU);CHR$(8);:GOSUB280:POKEV+33,.             PE
·187 FORX=.TO8:IF(LANDBO(X))THENPOKEFNPM(
X),10                                        AJ
·188 NEXT:X=.:A=FRE(.):A=.:IF(LAND(BO(U))
)THENPOKEFNPM(U),7                           GC
·189 IFPEEK(56321)<>NJTHEN189                NM
·190 POKEFNPM(X),1:IF(LANDBO(A))THENPOKEF
NPM(A),10:GOTO192                            IM
·191 POKEFNPM(A),2                           NP
·192 JY=PEEK(56321):GETA$:IFA$=CHR$(140)T
HEN259                                       EF
·193 P=L:IFJY=RJTHENA=X:X=X+1+(X=8)*9        HA
·194 IFJY=USAND(LANDBO(X))THENPOKEFNPM(U)
,10:U=X:POKEFNPM(X),7:GOSUB319               FC
·195 IFJY=USTHENRETURN                       MK
·196 IFJY=FJAND(DL(CL,2)ANDBO(X))THENL=(L
ORBO(X)):DL(CL,2)=DL(CL,2)-BO(X)             HP
·197 IFJY=BJAND(LANDBO(X))THENL=(LAND(511
-BO(X))):DL(CL,2)=DL(CL,2)ORBO(X):U=.        OM
·198 IFL<>PTHENGOSUB319:GOSUB97:GOTO186      FC
·199 GOTO190                                 CK
·200 IFB=6THENU=.:DL(HX,2)=DL(HX,2)OR(LAN
D238):L=LAND273                              HL
·201 IFCU=14THENRETURN                       HI
·202 D=INT(RND(1)*3+1):POKEV+33,HC(D-1):L
F=LF-(B/((LAND4)+1))+-D                      GI
·203 FORT=1TO100:NEXT:POKEV+33,.:IFLF<1TH
EN205                                        JA
·204 POKEV+32,(LF<5)*-2+(LF>=5ANDLF<10)*-
7:GOSUB324:GOSUB322:RETURN                   PJ
·205 POKEV+33,.:POKEV+32,.:GOSUB277:PRINT
"[CLEAR][RVSON][c 4]"TAB(9)"THOU ART SLA
IN !                                         AC
·206 PRINT"[RVSON][WHITE][DOWN][DOWN] DO
YOU WISH TO ENTER THE VAULT AGAIN?":POKE
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198,.                                         IA
·207 GETA$:IFA$=""THEN207                     IG
·208 IFA$="N"THENPOKE648,4:POKE679,.:SYS6
79                                            AP
·209 POKEV+21,.:RUN                           BO
·210 IFDD=6AND(LAND1)THENVS=.:DD=1:GOSUB9
7:RETURN                                      JE
·211 IFB=.ORRND(.)+LF/100<.5THENGOSUB324:
RETURN                                        KI
·212 POKEV+33,5:FORT=1TO100:NEXT:POKEV+33
,.:FORX=.TO15                                 KL
·213 ON1-(M(X)=.)GOTO214,217                  KJ
·214 IFCL=M(X)THENMH(X)=MH(X)-ABS(RND(.)+
((LAND2)*1)+LF/5)                             PM
·215 IFMH(X)>.THEN217                         NM
·216 M(X)=.:DL(CL,1)=.:POKEV+21,PEEK(V+21
)AND240:GOSUB277:GOSUB218                     IL
·217 NEXT:GOSUB324:GOSUB322:RETURN            CA
·218 LF=LF+B/4:DL(CL,2)=(DL(CL,2)ORBO(B-1
)):GOSUB97:GOSUB319:RETURN                    PO
·219 CU=RU-CU:PRINTCHR$(9);CHR$(CU);CHR$(
8);:POKEV+33,(CU=14)*-4                       LM
·220 GOSUB280:GOSUB322:RETURN                 EI
·221 IF(DL(CL,.)ANDBO(2))THENCL=CL+128:GO
SUB315:GOSUB97:GOSUB322:RETURN                FJ
·222 IF(DL(CL,.)AND24)=24AND(LAND384)=384
THENDL(CL,2)=DL(CL,2)ORBO(8):L=LAND255        FO
·223 IF(DL(CL,.)AND24)=24THENCL=CL-128:GO
SUB312:GOSUB97:GOSUB322:RETURN                GL
·224 IFCL=WLANDL=ALLTHEN232                   GO
·225 GOSUB319:GOSUB322:RETURN                 GL
·226 IFB=6THENGOTO212                         HK
·227 DL(CL+D(CD),.)=(DL(CL+D(CD),.)AND63)
:GOSUB280:GOSUB322                            HF
·228 RETURN                                   IM
·229 IF(DL(CL+D(CD),.)ANDBO(5))=.THENRETU
RN                                            DG
·230 IF(DL(CL+D(CD),.)ANDBO(5+CD))THENDL(
CL+D(CD),.)=DL(CL+D(CD),.)-BO(5+CD)           ML
·231 GOSUB324:GOSUB322:RETURN                 FN
·232 PRINT"[CLEAR]":PRINT"[DOWN][DOWN][RV
SON][WHITE] THE [RED]CROWN [CYAN]OF [PUR
PLE]SARNOTH [RED]HAS [YELLOW]BEEN [WHITE
]RETURNED!"                                   FB
·233 PRINT"[RVSON][c 7] NOBLE WARRIOR,YOU
 HAVE SURVIVED VAULT ":GOSUB280:GOTO206       AP
·234 FORX=1TO33:READA:POKE680+X,A:NEXT:PO
KE56334,PEEK(56334)AND254                     CE
·235 POKE1,PEEK(1)AND251:SYS681:POKE1,PEE
K(1)OR4:POKE56334,PEEK(56334)OR1              JE
·236 READA:IFA=-1THENRETURN                   KN
·237 FORX=.TO7:READD:POKE61440+A*8+X,D:NE
XT:GOTO236                                    DH
·238 PRINTCHR$(142)CHR$(8)CHR$(31)CHR$(19
);                                            FD
·239 FORH=1TO36:PRINT"[cEP]";:NEXT:FORV=1
TO23:PRINTTAB(1)"[cEP]"TAB(37)"[cEP]"         PO
·240 NEXT:FORH=1TO38:PRINT"[cEP]";:NEXT       FJ
```

```
·241 PRINT"[HOME][DOWN][DOWN]"TAB(2)"[PUR
PLE][3" "]PREPARE THYSELF,BRAVE WARRIOR[
3"."][DOWN]"                                  MN
·242 PRINTTAB(2)"[RVSON][c 4] [RVSOFF]$[R
VSON]  V A U L T  O F  T E R R O R  [RVS
OFF]$[RVSON] "                                OJ
·243 PRINTTAB(4)"[DOWN][DOWN][RVSOFF][GRE
EN] A [WHITE]3-D[GREEN]IMENSIONAL [WHITE
]ADVENTURE[GREEN] GAME  "                     BL
·244 PRINT"[9"[DOWN]"] "TAB(2)"[RVSON] PL
EASE WAIT[5"."]OPENING DUNGEON[3"!"]"         PP
·245 RETURN                                   IM
·246 D=.:FC=8:IFCL>127THEND=9:FC=15           AB
·247 P=6:D=.:FC=8:IFCL>127THEND=9:FC=15       LH
·248 FORX=DTOFC:ON1-(M(X)=.)GOTO249,255       PD
·249 IFCL<M(X)-PTHENA=M(X)+D(4)               NB
·250 IFCL>M(X)+PTHENA=M(X)+D(2)               MM
·251 IFCL>M(X)ANDCL<M(X)+PTHENA=M(X)+D(1)     OI
·252 IFCL<M(X)ANDCL>M(X)-PTHENA=M(X)+D(3)     ND
·253 IFA<.ORA>255THEN255                      FA
·254 IFDL(A,.)ANDDL(A,1)=.THENDL(A,1)=DL(
M(X),1):DL(M(X),1)=.:M(X)=A                   OK
·255 NEXT                                     IA
·256 D=DL(CL,1):IFDTHENONDGOSUB288,288,29
6,296,301,4,308,305:GOSUB322                  ND
·257 POKEV+21,.:FC=.:GOSUB116:IT=TI+1000:
RETURN                                        JB
·258 RETURN                                   IM
·259 PRINT"[HOME][RVSOFF][BLUE] SAVING";      KN
·260 OPEN1,8,15:PRINT#1,"S0:LASTDUNGEON":
CLOSE1                                        IL
·261 OPEN1,8,2,"LASTDUNGEON,U,W":FORX=.TO
2:FORD=.TO255:PRINT#1,DL(D,X)CR$              EP
·262 NEXTD:PRINT".";:NEXTX:PRINT".";:FORX
=.TO15:PRINT#1,M(X),CR$,MH(X),CR$             OF
·263 NEXTX:PRINT".";                          GH
·264 PRINT#1,CL,CR$,CD,CR$,LF,CR$,L,CR$,U
,CR$,DD,CR$,VS,CR$,HX,CR$,WL,CR$              CM
·265 PRINT#1,CC,CR$                           HC
·266 CLOSE1:GOTO185                           DJ
·267 PRINT"[4"[UP]"]":PRINTTAB(7);:INPUT"
[RVSON] FILENAME  ";A$:A$=LEFT$(A$,11)        MO
·268 F$="LASTDUNGEON":IFA$<>"[cEP]"THENF$
=A$                                           OH
·269 OPEN1,8,15:PRINT#1,"I0:":CLOSE1:OPEN
1,8,2,F$+",U,R"                               LH
·270 FORX=.TO2:FORD=.TO255:INPUT#1,DL(D,X
):NEXTD,X:FORX=.TO15                          DC
·271 INPUT#1,M(X),MH(X)                       FF
·272 NEXTX                                    NK
·273 INPUT#1,CL,CD,LF,L,U,DD,VS,HX,WL,CC      NG
·274 CLOSE1:OPEN1,8,15:INPUT#1,A,B$,C,D:C
LOSE1                                         KL
·275 IFATHENPRINT"[HOME][WHITE][RVSON]"TA
B(8)A;B$;C;D                                  KD
·276 FORT=1TO5000:NEXT:RETURN                 MP
·277 FORP=STOS+24:POKEP,.:NEXT:POKES+24,1
5:POKES+5,8:POKES+6,255                       LB
```

```
·278 POKES+4,21:F1=2:FORZ=1TO24:F2=80:POK
 ES+1,F1:FORY=1TO5:POKES+15,F2          FE
·279 F2=F2/1.1:NEXTY:F1=F1+9:NEXTZ:POKES+
 6,15:RETURN                            HH
·280 FORP=STOS+24:POKEP,.:NEXT:POKES+24,1
 5                                      MM
·281 POKES+5,8:POKES+6,255:POKES+4,23:F1=
 10                                     BG
·282 FORZ=1TO30:F2=30:POKES+1,F1:FORY=1TO
 10:POKES+15,F2                         OC
·285 F2=F2*1.01:NEXT:F1=F1+1:NEXT:POKES+6
 ,15:RETURN                             FC
·288 FORP=STOS+24:POKEP,.:NEXT:POKES+24,1
 5                                      MM
·289 POKES+5,8:POKES+6,255:POKES+4,23:F1=
 11:F2=25                               OJ
·290 FORZ=5TO50:POKES+1,F1:POKES+15,F2:F2
 =F2*.97:F1=F1+1:NEXT:POKES+6,15:RETURN OE
·296 FORP=STOS+24:POKEP,.:NEXT:POKES+24,1
 5:POKES+5,24:POKES+6,248:POKES+4,33    NJ
·299 FORP=17TO13STEP-1:POKES,P:FORT=125TO
 135:POKES+1,T:NEXTT,P:POKES+4,32       JF
·300 RETURN                             IM
·301 FORP=STOS+24:POKEP,.:NEXT:POKES+24,1
 5                                      MM
·302 POKES+5,8:POKES+6,255:POKES+4,23:F1=
 15:F2=F1                               PN
·303 FORZ=1TO10:POKES+1,F1:POKES+15,F2:F2
 =F2*1.01:F1=F1*1.3:NEXTZ               OI
·304 POKES+6,15:RETURN                  CA
·305 FORP=STOS+24:POKEP,.:NEXT:POKES+24,1
 5:POKES+5,8:POKES+6,255:POKES+4,23     GE
·306 F1=8:F2=4:FORZ=1TO30:POKES+1,F1:POKE
 S+15,F2:F2=F2*1.01:F1=F1+1:NEXT        KO
·307 POKES+6,15:RETURN                  CA
·308 FORP=STOS+24:POKEP,.:NEXT          CN
·309 POKES+24,15:POKES+5,155:POKES+6,245 OH
·310 POKES+4,129:FORP=50TO55:POKES,D    CE
·311 FORT=35TO55:POKES+1,T:NEXTT,P:POKES+
 4,128:FORT=1TO100:NEXT:RETURN          CE
·312 FORP=STOS+24:POKEP,.:NEXT:POKES+24,1
 5                                      MM
·313 POKES+5,8:POKES+6,255:POKES+4,23:FOR
 F1=4TO18STEP2:POKES+15,F1              CI
·314 FORF2=10TO180STEP2:POKES+1,F2:NEXTF2
 ,F1:POKES+6,15:RETURN                  NM
·315 FORP=STOS+24:POKEP,.:NEXT:POKES+24,1
 5                                      MM
·316 POKES+5,8:POKES+6,255:POKES+4,23   GF
·317 FORF=15TO8STEP-1:FORF1=18TO10STEP-2:
 POKES+15,F1                            JA
·318 FORF2=12TO4STEP-1:POKES+1,F2:POKES+1
 5,F:NEXTF2,F1,F:POKES+6,15:RETURN      GP
·319 FORP=STOS+24:POKEP,.:NEXT:POKES+24,1
 5                                      MM
·320 POKES+5,96:POKES+6,96:POKES+4,23:POK
 ES+2,85:POKES+1,36                     IG
·321 FORF=1TO10:NEXT:POKES+6,15:RETURN  OI
·322 FORP=STOS+24:POKEP,.:NEXT:POKES+24,1
 5                                      MM
·323 POKES+1,10:POKES,5:POKES+5,129:POKES
 +6,129:POKES+4,21:RETURN               BI
·324 FORP=STOS+24:POKEP,.:NEXT:POKES+24,1
 5                                      MM
·325 POKES+1,25:POKES,5:POKES+5,20:POKES+
 6,20:POKES+4,129:FORT=1TO75:NEXT       MP
·326 POKES+4,128:RETURN                 EH
·327 DATA 169,,133,251,133,253,169,208,13
 3,252,169,240,133,254,162,8            IB
·328 DATA 160,,177,251,145,253,136,208,24
 9,230,252,230,254,202,208,240,96       IC
·329 DATA035,24,60,110,110,110,110,110,11
 0                                      BJ
·330 DATA036,255,199,231,129,,60,126,255 KF
·331 DATA037,255,60,24,255,219,153,153,24 KF
·332 DATA038,24,24,60,102,102,60,,      MG
·333 DATA039,,126,127,127,112,126,,255  PD
·334 DATA040,110,110,110,110,110,110,110,
 110                                    EK
·335 DATA042,60,60,255,153,60,60,60,60  HG
·336 DATA081,255,231,231,231,231,219,195,
 231                                    DO
·337 DATA083,231,195,153,189,165,153,195,
 255                                    PD
·338 DATA086,27,31,31,27,59,123,219,155 CH
·339 DATA088,126,102,102,126,24,24,30,30 DK
·340 DATA091,216,248,248,216,220,222,219,
 217                                    JI
·341 DATA092,175,88,171,88,168,88,168,88 CL
·342 DATA102,219,54,219,102,219,54,219,10
 2                                      OK
·343 DATA104,24,255,192,192,192,255,24,24 BA
·344 DATA107,31,24,31,24,31,24,31,24    JM
·345 DATA108,255,182,255,191,240,176,247,
 176                                    JE
·346 DATA109,255,129,255,129,255,255,129,
 255                                    BK
·347 DATA115,248,24,248,24,248,24,248,24 GD
·348 DATA123,255,109,255,253,15,13,239,13 JH
·349 DATA163,255,159,159,239,247,251,253,
 255                                    IN
·350 DATA164,239,239,239,239,239,199,239,
 239                                    EG
·351 DATA165,189,129,153,189,165,129,195,
 231                                    MG
·352 DATA166,255,255,231,219,219,231,255,
 255                                    MD
·353 DATA167,207,183,123,195,129,,255,255 ED
·354 DATA168,199,239,131,239,239,239,239,
 239                                    IJ
·355 DATA169,199,215,199,239,239,239,231,
 231                                    CI
·356 DATA170,129,195,231,195,153,16,153,1
 95                                     KE
·357 DATA171,255,255,102,,90,,255,255   AC
·358 DATA173,255,129,255,255,231,231,255,
```

```
 255                                     IP
·359 DATA186,255,231,255,231,255,231,255,
 231                                     CN
·360 DATA189,255,129,255,239,255,129,255,
 239                                     EK
·361 DATA197,255,,255,255,255,255,,255   DE
·362 DATA220,250,21,218,21,26,21,26,21   IP
·363 DATA230,54,177,129,108,108,153,153,1
 02                                      MI
·364 DATA242,255,255,189,189,129,255,219,
 255,-1                                  EA
·365 DATA .,,,,,,,,,,,,,,,,.             MH
·366 DATA .,8,2,1,2,1,,1,1,1,,1,352,4,2,. JC
·367 DATA .,1,,16,,1,,1,,1,32,1,,2,2,.   FI
·368 DATA .,1,,1,1,2,16,1,,1,,1,,,1,.    FO
·369 DATA .,4,1,2,,1,,1,2,1,1,2,1,,4,.   HL
·370 DATA .,1,,1,,1,1,1,,,,,1,,,.        KK
·371 DATA .,2,1,1,1,1,32,1,1,4,1,2,1,1,34
 ,.                                      IO
·372 DATA .,,,,,,,,,,,,,,,,.             MH
·373 DATA .,2,1,1,2,16,2,1,1,1,,2,2,2,2,. OI
·374 DATA .,1,,1,,1,,1,,1,1,1,1,984,2,.  LO
·375 DATA .,2,1,1,,1,2,1,2,1,,32,2,2,2,. FG
·376 DATA .,,,2,,1,,1,,1,,129,,,,.       CG
·377 DATA .,24,1,1,1,1,,2,1,1,,1,65,,24,. NI
·378 DATA .,1,,,1,,1,1,,1,,1,,,1,.       FG
·379 DATA .,1,2,2,1,2,1,,,168,,129,2,1,1,
 .                                       MB
·381 DATA "[UP][RIGHT][s +][DOWN][RVSOFF]
 [LEFT][s M][s M][DOWN][LEFT][s M][s M]" GA
·382 DATA "[UP][UP]#[DOWN][LEFT]([DOWN][L
 EFT]([DOWN][LEFT]*"                     NG
·383 DATA "[UP][RVSON][c *][RIGHT][RIGHT]
 [sEP][DOWN][4"[LEFT]"][s B][RVSOFF]$$[RV
 SON][s B][DOWN][4"[LEFT]"][s B][c R][c R
 ][s B]"                                 IK
·384 DATA "[DOWN]&"                      PN
·385 DATA "[s J][s I][DOWN][LEFT][LEFT][3
 "[c +]"]"                               KF
·386 DATA "[UP]*[DOWN][LEFT][RVSOFF][s B]
 [DOWN][LEFT][s B]"                      BB
·387 DATA "[DOWN][LEFT][s X]"            FA
·388 DATA "[UP][UP][3"[LEFT]"][c *][RVSON
 ] [RVSOFF][sEP][DOWN][3"[LEFT]"][RVSON][
 sEP][c T][c *][DOWN][4"[LEFT]"][sEP] [RV
 SOFF]'[RVSON][SS][c *][DOWN][5"[LEFT]"][
 RVSOFF][c *][RVSON][3"[c T]"][RVSOFF][sE
 P]"                                     IK
·389 DATA "[LEFT][LEFT][RVSON][c *][sEP][
 c *][sEP][DOWN][4"[LEFT]"][4"="]"       JL
·390 DATA 1,1,2,2,3,3,4,5,5,6,6,6,7,7,7,8 LP
·391 DATA 1,1,2,2,3,4,<,<                HF
·392 DATA 1,1,2,2,3,4,<,<                HF
·393 DATA 1,1,2,2,3,65,":;",":;"         NK
·394 DATA 1,1,2,2,3,65,":978",":978"     NM
·395 DATA0,,,,,,,                        PD
·396 DATA0,,,,4,,32,6                    OC
·397 DATA0,96,5,60,160,8,255,16          JE
·398 DATA016,255,8,19,255,200,36,255     EC
·399 DATA036,9,255,144,18,255,72,37      FF
·400 DATA126,164,42,60,84,36,24,36       GF
·401 DATA042,60,84,4,90,32,2,126         AN
·402 DATA064,1,90,128,,36,,              AC
·403 DATA0,,,56,255,,67,255              CO
·404 DATA192,55,255,224,15,255,240,15    ED
·405 DATA255,240,15,255,240,14,255,176   CE
·406 DATA014,127,48,30,190,184,62,221    PJ
·407 DATA188,127,107,126,252,255,159,120 NB
·408 DATA221,143,120,73,7,56,127,3       LK
·409 DATA024,93,3,12,8,30,30,            FB
·410 DATA047,53,,10,85,,20,              DJ
·411 DATA052,66,15,24,102,31,44,90       KG
·412 DATA033,6,102,1,3,90,1,7            BN
·413 DATA165,227,11,219,211,21,231,175   PC
·414 DATA046,231,119,89,126,189,113,219  II
·415 DATA153,96,165,1,113,153,129,107    JI
·416 DATA126,193,102,195,97,37,129,161   CP
·417 DATA015,,241,15,,241,10,            DO
·418 DATA081,14,,113,58,,92,220          OD
·419 DATA0,120,,,132,,1,74               IC
·420 DATA016,1,2,40,3,135,40,5           OO
·421 DATA134,144,14,205,144,31,123,208   PH
·422 DATA061,183,248,61,207,228,41,183   FH
·423 DATA100,41,207,44,41,255,56,26      KB
·424 DATA001,24,3,207,,3,183,            HP
·425 DATA007,207,,5,122,128,11,239       NG
·426 DATA128,13,123,64,13,86,192,220     HF
·427 DATA0,248,,1,4,,2,2                 FH
·428 DATA0,2,138,,2,2,,2                 EO
·429 DATA002,,2,3,6,3,7,9                NF
·430 DATA003,143,9,3,223,9,13,254        ID
·431 DATA198,30,253,230,63,123,246,127   DO
·432 DATA183,255,191,207,247,223,183,250 JD
·433 DATA159,207,242,159,255,242,151,255 EA
·434 DATA210,103,255,204,2,,64,231       FO
·435 DATA003,231,192,7,219,224,7,189     LJ
·436 DATA224,15,219,224,15,231,240,15    JJ
·437 DATA255,240,15,255,240,15,255,240   KD
·438 DATA015,255,240,15,255,240,15,255   IJ
·439 DATA240,15,255,240,31,255,248,31    AP
·440 DATA255,248,31,127,216,61,239,124   LG
·441 DATA047,191,236,58,250,172,45,149   DN
·442 DATA246,95,86,174,164,221,202,102   OM
·443 DATA0,,254,,1,127,,2                HB
·444 DATA223,,4,207,,11,103,             GE
·445 DATA021,191,,43,215,,87,223         PF
·446 DATA0,87,224,,87,243,,91            KO
·447 DATA251,,45,255,,22,255,            PE
·448 DATA011,,,5,191,,2,192              PO
·449 DATA0,1,63,,,213,,                  AA
·450 DATA090,,45,,,42,220                MJ
·451 DATA127,,,254,128,,251,64           ED
·452 DATA0,243,32,,230,208,,253          FD
·453 DATA168,,235,212,,251,234,          FB
·454 DATA007,234,,207,234,,223,218       JP
·455 DATA0,255,180,,255,104,,            IP
```

IMPORTANT! Letters on white background are **Bug Repellent** line codes. **Do not enter them!** Pages 101 and 102 explain these codes and provide other essential information on entering *Ahoy!* programs. Refer to these pages **before** entering any programs!

```
·456 DATA208,,253,160,,3,64,                PI
·457 DATA252,128,,171,,,90,                 CO
·458 DATA0,180,,,84,,,220                   JK
·459 DATA061,188,,42,84,,61,188             JI
·460 DATA0,42,84,,61,188,,62                NK
·461 DATA124,,45,180,,61,188,               KI
·462 DATA042,84,,45,180,,62,124             EP
·463 DATA0,61,188,,42,84,,61                EL
·464 DATA188,,42,84,,45,180,                PN
·465 DATA058,92,,45,180,,21,90              IB
·466 DATA0,22,173,,11,86,128,239            GI
·467 DATA002,189,64,3,195,192,2,189         OC
·468 DATA064,2,195,64,3,189,194,2           FB
·469 DATA195,65,3,189,193,2,67,67           CH
·470 DATA005,166,199,10,221,74,21,106       KH
·471 DATA156,38,182,148,91,87,92,108        MC
·472 DATA171,182,87,85,202,88,169,170       LF
·473 DATA103,214,106,89,69,214,39,255       AA
·474 DATA236,26,105,88,7,255,240,28         AE
·475 DATA007,231,224,11,126,208,21,60       DM
·476 DATA168,46,255,116,95,126,250,95       IA
·477 DATA129,250,95,189,250,47,255,244      GK
·478 DATA020,255,40,11,,208,4,255           PB
·479 DATA032,3,,192,2,230,64,3              GL
·480 DATA153,192,3,219,192,2,36,64          GK
·481 DATA002,219,64,3,36,192,2,219          JH
·482 DATA064,3,36,192,2,219,64,             JI
·483 DATA0,252,,1,122,,3,183                FE
·484 DATA0,3,207,,1,254,,                   ID
·485 DATA252,,,120,,,120,                   JI
·486 DATA0,120,,,120,,,120                  JO
·487 DATA0,,120,,,120,64,                   FB
·488 DATA120,32,,120,32,,252,96             LG
·489 DATA001,255,192,15,,224,31,255         AH
·490 DATA240,24,3,240,15,255,224,221        OK
```

DVORAK KEYBOARD
FROM PAGE 57

C-64 VERSION

```
·10 REM DVORAK KEYBOARD FOR THE C-64        ND
·20 FORT=49152TO49198:READDT:POKET,DT:NEX
 TT                                         HO
·30 SYS49152:POKE49153,0:POKE49154,224:PO
 KE49156,0:POKE49157,224                    ML
·40 POKE49162,255:POKE49192,255:SYS49152    LJ
·50 POKE1,53:REM ACTIVATE RAM KERNAL        EE
·60 FORT=0TO32:REM REDEFINE NORMAL KEY DE
 FS                                         JN
·70 READAD:READVA                           HP
·80 POKE60289+AD,VA                         KF
·90 NEXTT                                   NG
·100 FORT=0TO37:REM REDEFINE SHIFTED KEY
 DEFS                                       DH
·110 READAD:READVA                          HP
·120 POKE60354+AD,VA                        KK
·130 NEXTT                                  NG
·140 NEW:END                                GH
·150 REM ML ROUTINE FOR COPYING BASIC AND
 KERNAL ROM TO RAM                          IN
·160 DATA173,0,160,141,0,160,172,5,192,19
 2,191,240,23,238,1,192,238,4,192           FI
·170 DATA173,4,192,240,3,76,0,192,238,2,1
 92,238,5,192,76,0,192,172,4,192,192        AF
·180 DATA255,240,3,76,13,192,96             FD
·190 REM NON SHIFTED DATA                   LC
·200 DATA62,39,9,44,14,46,17,80,22,89,25,
 70,30,71,33,67,38,82,41,76,46,63           GE
·210 DATA13,79,18,69,21,85,26,73,29,68,34
 ,72,37,84,42,78,45,83,50,45                GI
·220 DATA12,59,23,81,20,74,31,75,28,88,39
 ,66,36,77,47,87,44,86,55,90,40,91,43,61    IM
·230 REM SHIFTED DATA                       MH
·240 DATA59,64,24,38,27,42,32,40,35,41,40
 ,93,43,43                                  GP
·250 DATA62,34,9,60,14,62,17,208,22,217,2
 5,198,30,199,33,195,38,210,41,204,46,47    HH
·260 DATA13,207,18,197,21,213,26,201,29,1
 96,34,200,37,212,42,206,45,211,50,45       IO
·270 DATA12,58,23,209,20,202,31,203,28,21
 6,39,194,36,205,47,215,44,214,55,218       BO
```

C-128 VERSION

```
·10 REM DVORAK KEYBOARD FOR THE C-128       LI
·20 FAST                                    CF
·30 FORI=0TO177:REM COPY DOWN NORMAL KEY
 DEFS                                       EA
·40 POKEDEC("1300")+I,PEEK(DEC("FA80")+I)   CM
·50 NEXTI                                   MN
·60 FORI=0TO177:REM COPY DOWN SHIFTED KEY
 DEFS                                       BE
·70 POKEDEC("1359")+I,PEEK(DEC("FAD9")+I)   FH
·80 NEXTI                                   MN
·90 REM CHANGE KEY TABLE POINTERS           FD
·100 POKE830,DEC("00")                      CN
·110 POKE831,DEC("13")                      EO
·120 POKE832,DEC("59")                      DD
·130 POKE833,DEC("13")                      DI
·140 REM REDEFINE NORMAL KEY DEFS           LN
·150 FORT=0TO32                             NN
·160 READAD:READVA                          HP
·170 POKEDEC("1300")+AD,VA                  NA
·180 NEXTT                                  NG
·190 REM REDEFINE SHIFTED KEY DEFS          LM
·200 FORT=0TO37                             NI
·210 READAD:READVA                          HP
·220 POKEDEC("1359")+AD,VA                  LE
·230 NEXTT                                  NG
·240 SLOW                                   CE
·250 NEW:END                                GH
```

```
•260 REM NON SHIFTED DATA                              LC
•270 DATA62,39,9,44,14,46,17,80,22,89,25,
70,30,71,33,67,38,82,41,76,46,63                       GE
•280 DATA13,79,18,69,21,85,26,73,29,68,34
,72,37,84,42,78,45,83,50,45                            GI
•290 DATA12,59,23,81,20,74,31,75,28,88,39
,66,36,77,47,87,44,86,55,90,40,91,43,61                IM
•300 REM SHIFTED DATA                                  MH
•310 DATA59,64,24,38,27,42,32,40,35,41,40
,93,43,43                                              GP
•320 DATA62,34,9,60,14,62,17,208,22,217,2
5,198,30,199,33,195,38,210,41,204,46,47                HH
•330 DATA13,207,18,197,21,213,26,201,29,1
96,34,200,37,212,42,206,45,211,50,45                   IO
•340 DATA12,58,23,209,20,202,31,203,28,21
6,39,194,36,205,47,215,44,214,55,218                   BO
```

DISK CHECKUP

FROM PAGE 97

```
•100 GOTO 280                                          CG
•110 REM INNER TRACE LOOP                              NP
•120 PRINT#1,"U1 2 0";T;S                              IN
•130 INPUT#1, EN,EM$,ET,ES                             OA
•140 IF EN<>0 THEN GOTO 1960:REM DISK TRA
CE ERROR                                               AK
•150 LT%(I)=LT%(I)+1                                   HO
•160 IF OB%(T,S)<>0 THEN GOTO 1410:REM FI
LE INTERSECT                                           FJ
•170 OB%(T,S)=I                                        AD
•180 GET#2,A$,B$                                       DH
•190 IF A$="" THEN GOTO 1450:REM TRACE LO
OP CONTINUE                                            FI
•200 IF B$="" THEN B$=CHR$(0)                          OE
•210 T=ASC(A$):S=ASC(B$)                               EN
•220 GOTO 120:REM INNER TRACE LOOP                     EP
•230 REM********************************               CE
•240 REM DISK CHECK-UP                                 AI
•250 REM                                               JD
•260 REM   DON FULTON                                  FI
•270 REM********************************               CE
•280 DIM I,S,T,X,Y,Z                                   GA
•290 DIM BC,EN,ES,ET,IM,LC,OF,PF,S1,S2,SF
,T1,T2                                                 EB
•300 DIM TS%(144),SS%(144),LD%(144),LT%(1
44),PF%(144),N$(144)                                   NG
•310 DIM OB%(35,20)                                    HC
•320 CLOSE 1:OPEN 1,8,15:CLOSE 2:CLOSE 1               AN
•330 REM--------------------------------               CD
•340 PRINT CHR$(147)                                   FG
•350 PRINT                                             JJ
•360 PRINT "[12" "]DISK CHECK-UP                       OO
•370 PRINT "[11" "][c T]                               LL
•380 PRINT " CHECKS:                                   OD
•390 PRINT                                             JJ
•400 PRINT "  -- START LINKS DIFFERENT                 PB
•410 PRINT                                             JJ
•420 PRINT "  -- TRACE FILE LEN = DIR FIL
E LEN                                                  NA
•430 PRINT                                             JJ
•440 PRINT "  -- FILES DO NOT OVERLAP                  HC
•450 PRINT                                             JJ
•460 PRINT "  -- (3) BLOCKS FRE                        FO
•470 PRINT                                             JJ
•480 REM--------------------------------               DD
•490 REM SHO         -36 CY-           SHP             NP
•500 REM CMG                           CMM             GB
•510 REM CMG       BOX BELOW           CMM             BD
•520 REM CMG                           CMM             GB
•530 REM SHL         -36 CP-           SH@             FJ
•540 REM--------------------------------               DD
•550 PRINT " [s O][36"[c Y]"][s P]                     HL
•560 PRINT " [c G]THIS UTILITY DOES NOT W
RITE TO DISK.[c M]                                     EN
•570 PRINT " [c G][36" "][c M]                         CK
•580 PRINT " [c G][3" "][RVSON](PROBLEM F
ILES ARE DISPLAYED)[RVSOFF][4" "][c M]                 IA
•590 PRINT " [c G][10" "][RVSON]IN INVERS
E VIDEO)[RVSOFF][9" "][c M]                            OK
•600 PRINT " [s L][36"[c P]"][s @]                     PM
•610 FOR X=1 TO 1000:NEXT                              DO
•620 PRINT                                             JJ
•630 REM-------------------------------                CD
•640 REM FIND START OF ACTIVE FILES                    HM
•650 PRINT                                             JJ
•660 PRINT "[6" "]START[20" "]LENGTH  "                GB
•670 PRINT "FILE  T , S[4" "]FILE NAME[5"
 "]DIR--TRACE"                                         CE
•680 PRINT "[4"[c T]"]  [5"[c T]"][3" "][
11"[c T]"][4" "][3"[c T]"]  [5"[c T]"]"                DD
•690 OPEN 1,8,15                                       PG
•700 OPEN 2,8,2,"#"                                    EI
•710 T1=18:S1=1:I=1                                    KH
•720 REM NEXT DIRECTORY SECTOR                         LJ
•730 :  IF T1=0 THEN GOTO1010:REM DIRECTO
RY CLOSE                                               BI
•740 :   PRINT#1,"U1 2 0";T1;S1                        EI
•750 :   INPUT#1, EN,EM$,ET,ES                         JL
•760 :   IF EN<>0 THEN GOTO 1980:REM DISK
 ERROR                                                 PN
•770 :   GET#2,A$,B$                                   IE
•780 :   T2=T1:S2=S1                                   EG
•790 :   T1=ASC(A$+CHR$(0))                            DG
•800 :   S1=ASC(B$+CHR$(0))                            CK
•810 :   FOR X=2 TO 255 STEP 32                        CJ
•820 :     PRINT#1,"U1 2 0";T2;S2                      FF
•830 :     PRINT#1,"B-P 2";X                           FI
•840 :     INPUT#1, EN,EM$,ET,ES                       LI
•850 :     IF EN<>0 THEN GOTO 1980:REM DIS
K ERROR                                                CK
```

```
·860 :     GET#2,C$,D$,E$,F$,G$,H$,I$,J$,K
$,L$,M$,N$,O$,P$,Q$,R$,S$,T$,U$            KM
·870 :     IF C$="" THEN GOTO 980:REM DIRE
CTORY CONTINUE                             MG
·880 :     TS%(I)=ASC(D$+CHR$(0))          FB
·890 :     SS%(I)=ASC(E$+CHR$(0))          GF
·900 :     N$(I)=F$+G$+H$+I$+J$+K$+L$+M$+N
$+O$+P$+Q$+R$+S$+T$+U$                     LI
·910 :     PRINT#1, "B-P 2";X+28           GB
·920 :     GET#2,V$,W$                     NN
·930 :     LD%(I)=ASC(V$+CHR$(0))+256*ASC(
W$+CHR$(0))                                NH
·940 :     PRINT I;TAB(4)TS%(I);TAB(8)",";
TAB(9)SS%(I);                              IC
·950 :     PRINT TAB(13)N$(I);TAB(29)LD%(I
);TAB(33);"--";LT%(I)                      MA
·960 :     I=I+1                           MJ
·970 :     REM  DIRECTORY CONTINUE         BM
·980 :     NEXT                            DM
·990 GOTO 730:REM NEXT DIRECTORY SECTOR    IM
·1000 REM DIRECTORY CLOSE                  PI
·1010 IM=I-1                               GN
·1020 CLOSE 2:CLOSE 1                      CI
·1030 REM------------------------------    NE
·1040 PRINT                                JJ
·1050 PRINT " CHECKING START LINKS FOR OV
ERLAP"                                     HM
·1060 PRINT                                JJ
·1070 IF IM=0 OR IM=1 THEN GOTO 1250:REM
 START LINK END                            ON
·1080 FOR I=2 TO IM                        FJ
·1090 :  FOR Y=1 TO I-1                    GN
·1100 :    IF TS%(Y)=TS%(I)THEN IF SS%(Y)
=SS%(I)THEN GOTO 1150:REM FILE OVERLAP     NK
·1110 :  NEXT                              PP
·1120 NEXT                                 IA
·1130 GOTO 1250:REM START LINK END         CO
·1140 REM FILE OVERLAP                     BO
·1150 :    PF%(I)=1:PF%(Y)=1               GM
·1160 :    OF=1:REM SET OVERLAP FLAG       AK
·1170 :    PRINT Y;CHR$(18);TAB(4)TS%(Y);
TAB(8)",";                                 EH
·1180 :    PRINT TAB(9)SS%(Y);TAB(13)N$(Y
);CHR$(146);                               LO
·1190 :    PRINT TAB(29)LD%(Y);TAB(33);"-
-";LT%(Y)                                  LI
·1200 :    PRINT I;CHR$(18);TAB(4)TS%(I);
TAB(8)",";                                 IH
·1210 :    PRINT TAB(9)SS%(I);TAB(13)N$(I
);CHR$(146);                               DO
·1220 :    PRINT TAB(29)LD%(I);TAB(33);"-
-";LT%(I)                                  FI
·1230 GOTO 1110:REM START LINK CONTINUE    HN
·1240 REM  START LINK END                  LM
·1250 IF OF=0 THEN PRINT "[5" "]--START L
INKS OK--"                                 IH
·1260 REM------------------------------    KC
·1270 PRINT                                JJ
·1280 PRINT " TRACING FILES"               KC
·1290 PRINT                                JJ
·1300 OPEN 1,8,15                          PG
·1310 OPEN 2,8,2,"#"                       EI
·1320 IF IM=0 THEN GOTO 1530:REM TRACE EN
D                                          KO
·1330 FOR I=1 TO IM                        FI
·1340 :     T=TS%(I)                       BC
·1350 :     S=SS%(I)                       BC
·1360 :     LT%(I)=0                       PD
·1370 :     PF$=""                         GN
·1380 :     SF=0                           CH
·1390 :     GOTO 120:REM INNER TRACE LOOP  KI
·1400 :     REM FILE INTERSECT             FA
·1410 :     PF%(OB%(T,S))=1                DO
·1420 :     PF%(I)=1                       OA
·1430 :     SF=1:REM SET INTERSECT FLAG    FN
·1440 :     REM TRACE LOOP CONTINUE        GG
·1450 :     BC=BC+LT%(I)                   GJ
·1460 :     PRINT I;TAB(4)TS%(I);TAB(8)","
;TAB(9)SS%(I);                             IC
·1470 :     IF LT%(I)<>LD%(I) THEN PF%(I)=
PF%(I)+2:PRINT CHR$(18);                   CM
·1480 :     PRINT TAB(13)N$(I);TAB(29)LD%(
I);TAB(33);"--";LT%(I)                     MA
·1490 :     IF PF$<>""THEN PRINT "[3" "](F
ILE";I;"CONTAINS ";+PF$;")":PRINT          FG
·1500 :     IF SF=1 THEN PRINT "[3" "](FIL
E";I;"INTERSECTS FILE ";OB%(T,S);")":PRI
NT                                         PC
·1510 NEXT                                 IA
·1520 REM TRACE END                        CM
·1530 CLOSE 2:CLOSE 1                      CI
·1540 REM------------------------------    NE
·1550 PRINT                                JJ
·1560 PRINT " PROBLEM FILES--"             MI
·1570 PRINT " [13"[c T]"]"                 IF
·1580 IF IM=0 THEN GOTO 1710:REM PROBLEM
FILE END                                   CO
·1590 FOR I=1 TO IM                        FI
·1600 :  IF PF%(I)=0 THEN GOTO 1690:REM P
ROBLEM LOOP CONTINUE                       IE
·1610 :  PF=1:REM SET PROBLEM FILE FLAG    KG
·1620 :  PRINT I;                          LL
·1630 :  IF PF%(I)=1 OR PF%(I)=3 THEN PRI
NT CHR$(18);                               PG
·1640 :  PRINT TAB(4)TS%(I);TAB(8)",";TAB
(9)SS%(I);                                 CE
·1650 :  PRINT CHR$(18);TAB(13)N$(I);CHR$
(146);                                     FM
·1660 :  IF PF%(I)=2 OR PF%(I)=3 THEN PRI
NT CHR$(18);                               OD
·1670 :  PRINT TAB(29)LD%(I);TAB(33);"--"
;LT%(I)                                    BH
·1680 :  REM  PROBLEM LOOP CONTINUE        LM
·1690 NEXT                                 IA
·1700 REM PROBLEM FILE END                 OM
·1710 IF PF=0 THEN PRINT "[6" "]NONE"      GB
```

```
•1720 PRINT                                    JJ
•1730 PRINT " BLOCK COUNT = ";BC               NP
•1740 PRINT                                    JJ
•1750 PRINT " BLOCKS FREE = ";664-BC;TAB(
 20)"(TRACE)"                                  CO
•1760 FOR I=0 TO IM                            FH
•1770 :  LC=LC+LD%(I)                          EA
•1780 NEXT                                     IA
•1790 PRINT " BLOCKS FREE = ";664-LC;TAB(
 20)"(DIR)"                                    OH
•1800 REM--------------------------------      NE
•1810 REM DIR BAM BLOCKS FREE                  KG
•1820 OPEN 1,8,15                              PG
•1830 OPEN 2,8,2,"#"                           EI
•1840 PRINT#1,"U1 2 0";18;0                    EA
•1850 INPUT#1, EN,EM$,ET,ES                    BP
•1860 IF EN<>0 THEN GOTO 1980:REM DISK ER
 ROR                                           PO
•1870 FOR X=0 TO 35                            CC
•1880 :  GET#2,W$,X$,Y$,Z$                     DK
•1890 :  IF X<>0 AND X<>18 THEN BU=BU+ASC
 (W$+CHR$(0))                                  JE
•1900 NEXT                                     IA
•1910 PRINT " BLOCKS FREE = ";BU;TAB(20)"
 (BAM)"                                        KN
•1920 CLOSE 2:CLOSE 1                          CI
•1930 END                                      IC
•1940 REM--------------------------------      NE
•1950 REM DISK TRACE ERROR                     EI
•1960 IF EN=66 THEN PF$="ILLEGAL LINK":GO
 TO 1450:REM TRACE LOOP CONTINUE               LB
•1970 REM DISK ERROR                           IP
•1980 PRINT                                    JJ
•1990 PRINT " UNRECOVERABLE DISK ERROR"        GI
•2000 PRINT                                    JJ
•2010 PRINT EN;EM$;ET;ES                       NP
•2020 CLOSE 2:CLOSE 1                          CI
•2030 END                                      IC
```

SCUTTLEBUTT

Continued from page 14

within a range of 10,000 years, and zoom in for views of constallations, the moons of Jupiter, a solar eclipse, the position of Halley's Comet, the Virgo Cluster of galaxies, Venus crossing the sun, and more. Price is $64.95; lab pack, $194.85.

CBS Interactive Learning, 203-622-2500 (see address list, page 14).

AMIGA MANUAL

The final release in Addison-Wesley's four-volume Amiga Technical Reference Series, the *Amiga ROM Kernal Reference Manual: Libraries and Devices* ($34.95), lists and describes the Amiga's built-in ROM routines and systems software which support graphics, sound, and animation. (Previously published were the *Amiga Hardware Reference Manual, Amiga Intuition Reference Manual,* and *Amiga ROM Kernal Reference Manual: Exec,* each $24.95.)

Addison-Wesley Publishing Company, 617-944-3700 (see address list, page 14).

DIGITAL SAMPLING

Sampler-64 allows the musician to digitally convert audible sound into a series of numbers that can be stored in memory, processed in various ways, and replayed on a keyboard. Complex sounds can be created with facilities like looping, dubbing (mixing different sampled sounds), block editing (dividing a sample into eight blocks which can be arranged at will), echo, and reverb. The package includes a small hardware box that attaches to the 64's user port, menu-driven software, a microphone, and a cable to route output to a TV. A MIDI interface that will be available by the end of the year will allow keyboard control of *Sampler-64*, and incorporate a sequencer. Price is $89.95 plus $3.50 shipping; PA residents add 6% sales tax.

The *Com-Drum* upgrade for *Sampler-64* turns the program into a drum machine, with real time and step time sequencer, three different drumkits with eight precussion sounds to each, and variable tempos and time signatures. Price is $29.95, or $14.95 when purchased with *Sampler-64.* (PA residents add 6%.)

Micro Arts Products, 215-336-1199 (see address list, page 14).

HOW-TO PROGRAMS

ShareData will market a *Home Companion* series of interactive how-to software, providing information to help the user diagnose and solve specific problems in areas like auto maintenance, weight control and nutrition, and money management. Twenty programs are planned, with five scheduled for fall release. Price will be under $10 each.

ShareData, Inc., 612-829-0409 (see address list, page 14).

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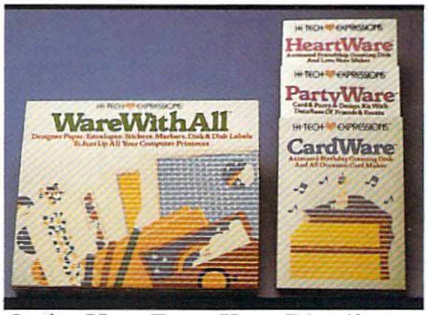
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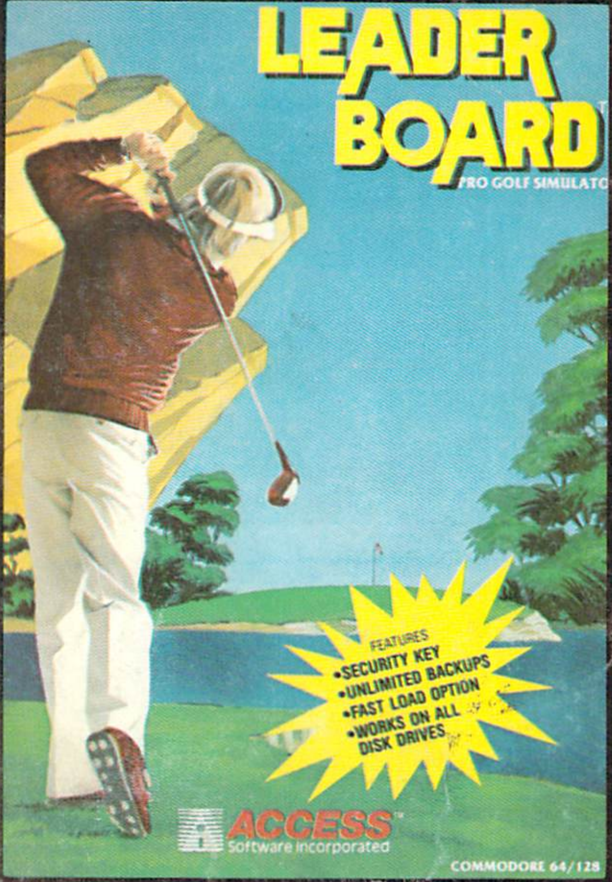
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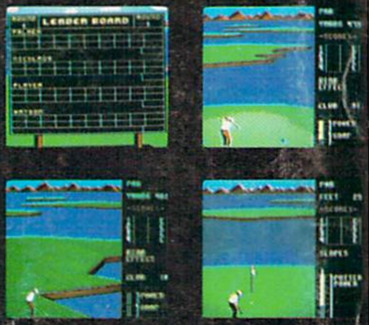


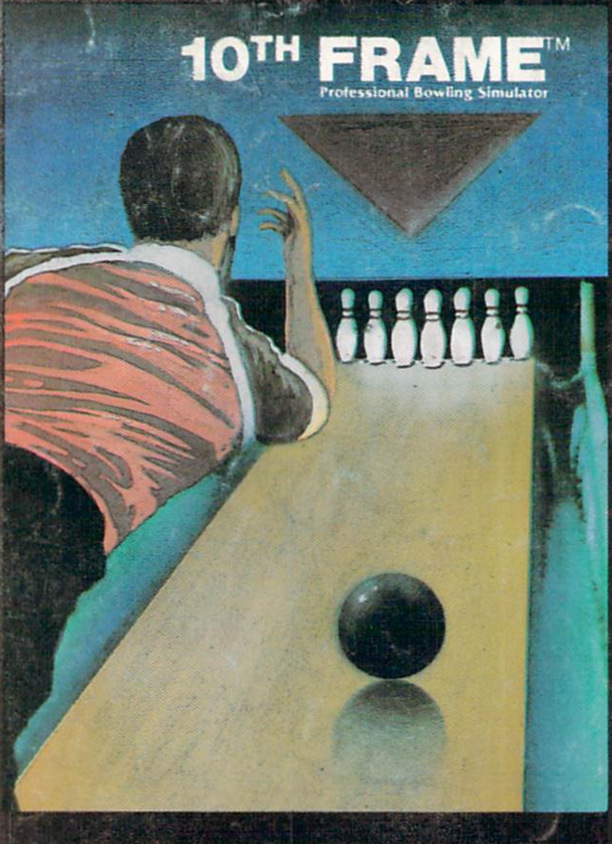
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